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AUTHOR Epps, Susan
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ABSTRACT

This manual, the second of a two-part study, addresses issues involved in behavioral interventions with low incidence, severely handicapped students. Initial chapters focus on selecting appropriate goals, writing behavioral objectives, and selecting observational systems to measure behavior change. General treatment procedures for increasing and decreasing behavior as well as for teaching new behavior are reviewed. Specific behaviors (toileting skills, self-care skills, self-stimulation, and self-injurious behavior) are considered in a fourth chapter. Techniques for maintenance and generalization of behavior change are described in chapter 5, followed, in chapter 6, by a review of adaptive equipment and electronic technology for individuals with severe physical disabilities. A final chapter presents six guidelines for implementing programs, including examining potential negative consequences of reinforcers and providing adequate training for all personnel involved in the treatment procedures. (CL)

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Designing, Implementing, and Monitoring Behavioral Interventions with the Severely and Profoundly Handicapped

Susan Epps

Iowa State University

October, 1983

TABLE OF CONTENTS

List of Figures iii

Preface iv

Chapter 1 GOALS AND OBJECTIVES 1

Selecting Appropriate Goals 1
Conducting a Situational Analysis 7
Writing Behavioral Objectives 13

Chapter 2 SELECTING OBSERVATIONAL SYSTEMS 20

Types of Measurement 20
Inter-Observer Agreement 27
Training Observers 29
Formative Evaluation 35
Conventions in Graphing Data 41
Evaluating Behavior Change 57

Chapter 3 GENERAL TREATMENT PROCEDURES 61

Increasing Behavior 61
Teaching New Behavior 74
Decreasing Behavior 88

Chapter 4 TREATMENT OF SPECIFIC TARGET BEHAVIORS 133

Toileting Skills 133
Self-Care Skills 138
Self-Stimulation 139
Self-Injurious Behavior 141

Chapter 5 MAINTENANCE AND GENERALIZATION OF BEHAVIOR CHANGE 144

Maintenance 145
Generalization 148

Chapter 6 ADAPTIVE EQUIPMENT AND ELECTRONIC TECHNOLOGY 156

Adaptations for the Physically Handicapped 156
Microswitches 156

Chapter 7 GUIDELINES FOR IMPLEMENTING PROGRAMS 158

References 161

Appendices

A	Interview Format	172
B	Example Interview	174
C	Responses to Practice Exercise 1: Goals and Objectives	177
D	Whole- and Partial-Interval Recording	179
E	Responses to Practice Exercise 2: Measuring Behaviors	180
F	Calculating Coefficients of Agreement for Measures of Permanent Product and Interval Recording	181
G	Calculating Coefficients of Agreement for Event, Duration, and Latency Recording	183
H	Summary Raw Data Sheet (First Condition Only)	184
I	Answers to Practice Exercise 3: Determining Record Floors and Ceilings	185
J	Standard Behavior Chart	188
K	Practice Exercise 4: Application of a Shaping Procedure	189
L	Examples of Change and No-Change Situations When Considering Trend, Latency, Level, and Mean or Median	192

List of Figures

Figure 1.	Sequence analysis of Michael's lunchtime behavior	9
Figure 2.	Percent of bites of vegetables accepted during baseline and treatment conditions	43
Figure 3.	Variations in graphic presentation of missing data	44
Figure 4.	Conventions for indicating omissions in ordinate and abscissa	54
Figure 5.	Task analysis of the chain "changing a stained pad"	84
Figure 6.	Performance in menstrual-hygiene skills taught by forward chaining	85

Preface

This manual is the second of a two-part series on assessment and interventions with low-incidence populations. Low incidence refers to populations such as deaf, blind, and severely and profoundly handicapped (SPH) that occur with low frequency. The first manual, Assessment and planning with low incidence populations: A functional and chronological age appropriate approach for school psychologists, is by Greg Robinson at the Iowa Braille and Sight Saving School. It should be read prior to this manual. Although the first manual focuses on assessment and this one on interventions, it is important to note that the two go hand in hand. In our initial assessments of low-incidence populations, we want to gather information that is useful for planning interventions. Similarly, when we implement treatment procedures, we continuously assess the student so that we can evaluate the effectiveness of our program. Each manual has an accompanying videotape that illustrates assessment and intervention procedures conducted in a school setting.

It is not possible to cover all the important topics regarding interventions with low-incidence populations, which I refer to as SPH throughout this manual. I have attempted to cover the central issues related to treatment procedures to give you a conceptual understanding of essential components of any behavioral intervention. These areas include appropriate goal selection, behavioral objectives, observational systems, behavioral principles, and procedures for facilitating generalization and maintenance. In addition, there are chapters on interventions for specific problem areas such as self-

injurious behavior and on the use of adaptive equipment and microswitches. Applied examples are interspersed throughout the manual (I refer to students randomly as either he or she), and numerous references are included to provide sources for obtaining more information.

I would like to acknowledge Jeff Grimes and Steve Mauer for their support in securing funds for the project and for their active interest in providing a vehicle for disseminating this information to school psychologists throughout Iowa. I would also like to thank Shannon Worringham for her professional assistance in the preparation of this manual.

Finally, I invite you to write me and share your thoughts on the manual and videotape. Which parts were most helpful and which needed further clarification?

Susan Epps
Department of Psychology
Iowa State University
Ames, Iowa 50011

Chapter 1

GOALS AND OBJECTIVES

There is considerable heterogeneity within the severely and profoundly handicapped (SPH) population; the numbers and kinds of behavioral excesses and deficits are enormous. A delay in intellectual functioning is frequently not the only disability; SPH students also may possess multiple and overlapping handicaps. For example, one or more sensory channels such as vision or hearing may be damaged seriously enough to hinder instruction. These conditions certainly affect the selection of specific intervention strategies. Therefore, individualizing instruction as well as individualizing goal selection is especially necessary for this population (Smith & Snell, 1978a).

Selecting Appropriate Goals

Considering that goals and objectives for this population typically extend over a long period of time, a substantial amount of time will be wasted if the goal we select for a particular student is inappropriate. We must be very careful in our initial selection of goals and must consider each person's needs. Performance deficits must be identified and weighed in light of the ultimate goal of all objectives, i.e., the maintenance of each individual in the least restrictive environment possible. Thus, our major concern should be in selecting <u>functional</u> goals. We take a functional approach when we target basic behaviors that are required for daily existence such as self-help skills (e.g., grooming, dressing, toileting, and eating). This emphasis on functional skills requires that we tailor the educational curriculum to teach these essential skills. Such an

approach would yield a considerable time savings because impractical goals would be omitted (Snell, 1981).

Generally, selection of target behaviors and goals is usually left to professionals; parents typically have minimal participation in this endeavor. As pointed out by Spradlin and Spradlin (1976), however, parents can assist in developing a functional curriculum for their child. Their active involvement is possible only when we actively seek their input. To begin this process, then, we should observe the student in the school situation and then compare notes with the parents regarding the skills their child does or does not exhibit at home. (If possible, there are advantages to directly observing the student in his home environment, particularly if there is some question about the accuracy of parental reports). After observations in the home and school environments, any discrepancies in the student's behavior in the two settings should become apparent. Once the parents and school personnel have agreed on the behaviors the student does and does not have in his repertoire, both should work together to set goals that reflect the demands of the home as well as to prepare the student for school experiences. (Note: Such involvement from the family may be less of an issue for institutionalized persons or for persons in settings who do not return home except for an occasional week end a year.)

When selecting target behaviors and goals, we need to consider a person's chronological age as well as ability level. Moreover, these goals will vary somewhat depending on the community setting for which these individuals are being prepared. An important point to keep in mind, as noted by Lent and McLean (1976), is that <u>all instructional</u>

goals and obectives should have community-transition value. To begin with, then, the best way to establish pragmatic long-term goals is to talk with the people who will work with these severely handicapped persons as adults and actually to visit community programs and job-placement sites for handicapped people. Once we have determined that an SPH student probably will be in a certain setting when he leaves school, the next question we must ask ourselves is, "What skills does he need to live there successfully?" To answer this question, we need to visit that setting, to observe the environment systematically, and to study the behavior patterns that are expected there (Smith & Snell, 1978a).

We already have noted that a major purpose of educational programs for severely handicapped students is to prepare them to function as independently and effectively as possible in a variety of least restrictive current and subsequent natural environments. Clearly then, it is essential to obtain vital informtion about these environments. Falvey, Brown, Lyon, Baumgart, and Schroeder (1980) detail one set of procedures, called an ecological inventory strategy, that can be used to secure this information. The information obtained from this procedure can assist school personnel in designing and implementing functional and effective preparatory educational programs for severely handicapped students. The rationale here is that the performance criteria required of nonhandicapped persons in natural environments should serve as a guide to establishing the performance criteria in educational programs for SPH students. The ecological inventory strategy is an important tool that can be used to provide us with information about the actual skills that are necessary in order to

function in those natural environments and the naturally available cues and correction procedures under which these skills are typically performed.

Since probably the most efficient procedure for identifying appropriate cues and correction procedures is to observe people engaging in the activity in the natural environment, we should go through the following three steps: (a) list the current and anticipated least restrictive natural environments in which the SPH student might function; (b) list the functional skills that are performed in those environments; and (c) identify the naturally occurring cues and correction procedures that are available to nonhandicapped people in these environments. Although we may consider steps a and b, we often fail to consider step c. It is very important to realize that the naturally occurring cues and correction procedures that are functionally related to the performance of a particular skill might be different across different environments. For example, in some grocery stores, modeled cues (e.g., observing others go to the appropriate cash register) and pictorial cues (e.g., observing the total cost of the purchase on the cash register) may be available, while in other grocery stores, a gestural cue (e.g., a cashier's gesturing for the shopper to come to the available cash register) and indirect verbal cues (e.g., a cashier's orally stating the total cost of the purchase) may be the only natural cues. Since these naturally occurring cues and correction procedures vary across natural environments, we first need to identify the most likely environment in which the SPH individual will be required to function and the natural cues and correction procedures in these environments. Then we can tailor our instructional program to

prepare the student to function appropriately in the presence of these variations.

Once we have determined the cues and correction procedures that are naturally available in a particular environment, we need to assess the student's existing performance repertoire. In order to determine the instructional cues and correction procedures that a particular SPH student needs to be taught, we can use the following steps: (a) list the skills that are required in a particular natural environment; (b) list the cues and correction procedures that are required to function appropriately in that environment; and (c) take the student to this natual environment and observe how he performs in response to these cues and correction procedures. We should make a concerted effort to observe the student in a natural setting. If this observation is not possible, we will need to assess the student's skills in a simulated classroom setting. If we conduct our training sessions in this setting rather than in the real environment, we will have to worry about generalization. Whether or not skills acquired in one setting transfer to another setting is a signficiant problem with the SPH population. Generalization and maintenance issues are discussed in Chapter 5.

Summary of Goal Selection

Before we can develop specific annual goals and behavioral objectives for a student, we must decide on the ultimate goal of each student's special-education program. Therefore, we need to answer the question of what eventually will become of the student; for what type of environment are we preparing the student to function when he leaves school? For the SPH population, we must select functional goals that will enable them to function as independently as possible in the least

restrictive environment. Therefore, we would select a goal to improve self-help skills or some vocational skill before attempting to modify puzzle-putting-together behavior.

For cases in which SPH individuals spend a significant amount of time at home, parents should be involved in the process of goal selection. Professionals in the school setting should be interested in preparing these students to function as independently as possible in the home environment in addition to the school and post-school environments.

One criterion for evaluating the appropriateness of a goal is the extent to which it prepares the student to function in the community (i.e., post-school setting). Therefore, it is essential that we analyze these natural environments to determine what skills are necessary to function in them and what naturally occurring cues and correction procedures are available. While many of the goals for the SPH population are similar in that they pertain to developing self-help skills, many other goals we set will not be the same for all of these students because their post-school environments will vary.

After you have specified a goal, examine it carefully. First, does it relate to a functional behavior (does it relate to a useful skill that will enable the student to do something we regard as important)? And second, even though the goal may be functional, will that particular student have the opportunity to engage in that behavior in the natural environment? If the answer to either of these questions is no, rewrite the goal.

Conducting a Situational Analysis

We want to be careful to select appropriate goals for the SPH population that will help each student function as independently as possible in daily living. Although we may be able to determine on an a priori basis which goals are functional, we do not know if they are developmentally appropriate for a student without gathering information about this particular student. To obtain more information, we can conduct a situational analysis which consists of at least three parts. These are briefly reviewed below. Note that the situational analysis should be a part of any assessment, particularly for SPH students. More information about it can be found in the assessment manual by Robinson (1983). If, however, you have gotten to the intervention stage and no one has done a situational analysis, you will need to do one yourself.

The situational analysis can provide us with valuable information about a student and will be helpful in refining goals into specific behavioral objectives. Sulzer-Azaroff and Mayer (1977) discuss two important parts. The first is a review of the student's school records. Although standardized test results may provide information about a student's overall level of functioning, there are numerous other sources of information that potentially will provide more relevant information for planning interventions. If you have a student who already has been placed in a classroom, for sure look at the teacher's records of the student's behaviors. Examine any behavioral assessment systems the teacher has used. There may be helpful information in the school records as well about behaviors in the student's repertoire or about intervention strategies previously

employed. Try to be careful of information that might bias you. For example, there may be statements in records that a student has no functional self-help skills. These very well may be true, but they do not necessarily mean that no self-help skills can be taught to the student. The point is, we want to be careful not to rule out trying another treatment for a behavior that previously was targeted, but with little behavior change.

The second component of a situational analysis is a narrative recording which is a continuous description of what occurs during an observation session. The observer writes down everything that occurs including behaviors of other people besides the student. The end product of this continuous recording looks something like a paragraph. The next step, then, is to reorganize it into a sequence analysis which consists of three columns of information: (a) antecedent events and conditions that seem to precipitate the student's behavior, (b) the student's behavior, and (c) events that follow as consequences of the act. People sometimes refer to a sequence analysis as an "ABC" which stands for antecedents, behavior, and consequences. Figure 1 contai a small portion of a sequence analysis conducted during the teacher's first training session for improving her students' mealtime behaviors.

A sequence analysis can provide some extremely useful information that not only will help us to refine goals, but also to set up an intervention itself. First, it yields information about events (e.g., behaviors of others or environmental conditions) that tend to lead to the student's engaging in a behavior. For example, we may notice that Emma only engages in self-injurious behavior (s-i-b) when she is presented with a task to do.

Student: Michael Date: 6-13-83 Time: 12:10

Activity: Training session for teaching appropriate lunchtime behaviors

Persons present: Teacher and aide; Michael, Angie, Frank, Daniel, and Emily

Situational conditions: Recreational room with two tables and mini kitchen

Antecedent Event	Michael's Behavior	Consequent Event
Teacher says, "Michael, sit and wait for your plate."	Looks at teacher; looks around room; flaps right hand in air.	Teacher ignores Michael.
Teacher continues putting food on students' plates.	Walks around room.	Teacher manually guides Michael to sit back down.
Aide instructs (via sign language and oral request) Michael to get milk.	Looks at aide	
Aide repeats request and presents a gestural prompt (points to refrigerator).	Walks to refrigerator; opens door; gets milk.	No response from aide.
Aide says, "Shut the door."	Shuts refrigerator door.	Aide says, "Good job, Michael; you shut the door."

Figure 1. Sequence analysis of Michael's lunchtime behavior.

Second, a sequence analysis provides information about whether or not a behavior is in the student's repertoire under those environmental conditions in which the observations were done. For example, we may never observe Joshua neatly make up his bed by first straightening out the sheet and then pulling up the blanket. We infer that making up his bed is not in his behavioral repertoire. However, we do see approximations of the behavior, i.e., at least he pulls the blanket partially over the bed. Thus in our intervention progrm, we may want to use a shaping (or chaining) procedure to improve his bed-making skills.

Third, sequence analyses allow us to estimate the relative amounts of time that the student engages in certain behaviors. For example, we may observe that Gene sits in his chair staring out the window about 25% of the time during his prevocational-work activities and packs car points in boxes the remaining 75% of the time. We don't expect students to be working 100% of the time, and we may decide that 75%-85% of the time would be a reasonable expectation. In this case, then, Gene's work productivity may be okay, so we decide to target another behavior that warrants more attention.

Fourth, a sequence analysis can give us information about consequent events that increase, decrease, or maintain the student's behavior. An analysis of Emma's sib revealed that when Emma slapped herself in the face, both teachers and parents withdrew the request for her to complete a task. Their behavior (withdrawal of the task) negatively reinforced Emma's sib, i.e., her sib increased when they removed the aversive stimulus. Again this information is invaluable to us when we plan treatment. We will want to change the behavior of the

teachers and parents so that they do not remove the task when Emma slaps herself. Rather, they should use extinction (ignore her when she engages in sib), forced compliance (manual guidance to get her to complete the task), and DRO (reinforcing her for not slapping herself).

And fifth, information obtained from a sequence analysis can help us to identify possible reinforcers. In our observations, we may notice certain high-rate behaviors, repeated requests from the student for something, or various events that do seem to increase the likelihood that the student will engage in a behavior again. This information provides us with essential data. Without knowledge of what is reinforcing for a student, when we start our intervention, we are likely to get nowhere fast.

From the sequence analysis presented in Figure 1, we can get some information about Michael's behavior. He responds to a number of prompts, but may have a tendency to engage in self-stimulation or to wonder if he has nothing else to do. We also can get information about the teacher's and aide's behaviors. They seem to be able to use prompts fairly effectively although they may be using obtrusive ones (e.g., physical prompts) unnecessarily. The aide has obviously had some training in using social reinforcement because she used labeled praise (specific to Michael's behavior). However, they may need to be reminded about using continuous reinforcement for Michael's appropriate behaviors since we are in the early acquisition stage of skill development.

One final point is important to keep in mind before you begin narrative recordings or more systematic observations of a student: how representative is this observation of the student's typical behaviors?

Did you catch the student on a particularly good or off day? One thing you might want to do is ask the teacher (without interpreting the behavior) if what occurred during the observation period was fairly typical of the student's behavior. It is also desirable to observe him in a variety of settings, e.g., in structured and unstructured activities, in small-group v. one-on-one activities, with different teachers, with different students, at different times of the day or week, etc.

A third important part of a situational analysis, in addition to reviewing records and conducting sequence analyses, is interviewing significant people in the student's environment, e.g., teachers, aides, and parents. These people will have interacted with the student far more often than we and can provide us with valuable information in order to specify behavioral objectives and to plan interventions. One type of interview format was outlined by Robinson (1983) in the assessment manual. He recommends use of the "Parent Inventory" which parents (or any significant person in the student's life) complete. The school psychologist then goes through the inventory with the parents and seeks additional information as needed. This sort of inventory, as a format for helping us obtain information about a student, is an excellent way to secure vital information for setting goals.

Another interview guide you may want to use can be found in Appendix A. It is a modified version of a format I used at the John F. Kennedy Institute for Handicapped Children in Baltimore. It is extremely useful for a variety of populations, including the severely and profoundly handicapped. To use it, have a copy of each page plus a

sheet of regular paper for additional notes you may want to make. First go through the "Behavior Problem Checklist" and just check off what the person views as a problem. Then prioritize these and get detailed information on those you plan to do interventions on (I usually do three). Of course you will want to rephrase so you do not sound esoteric. For example, when you see "Antecedents", you might say something like, "What sorts of things happen just before Paul starts flapping his hands in the air?" or "What things seem to get Paul to start flapping his hands?" As you conduct this structured interview, it is usually possible to have the student in the room with you. Having parent and child or teacher and student together allows you: (a) to gain specific information about major concerns, behavioral dimensions, antecedents, consequences, previous strategies employed to address the problems, and possible reinforcers, (b) to observe the student's behavior (even during the interview you can often take frequency data), and (c) to observe the parent or teacher and the child interact (so you can conduct a mini sequence analysis). Included in Appendix B is an example of some information I obtained while interviewing the mother of a 3-year-old moderately to severely mentally retarded boy (it does not reflect all the information I obtained on the case). The interview data helped me in deciding which behaviors to target and in planning my intervention.

Writing Behavioral Objectives

In order to get down to specific program planning, we need to specify a set of more immediate aims than the long-term goal; thus we specify annual goals (White & Haring, 1980). These goals should be based directly on the data we gather in our initial assessment of the

student and of the post-school setting in which we expect her ultimately to function. Once we have outlined the annual goals, we need to prioritize them by considering the future utility of the skill and the degree to which the skill is a prerequisite to growth in other areas. Chances are you will come across goals that were written for an SPH student that you view as functionally inappropriate. Remember that these goals indeed can be changed as necessary. Do not proceed with writing specific behavioral objectives and targeting specific behaviors until you have analyzed the appropriateness of the goals. If they are off base, so will be your entire educational program for the student.

Although annual goals may get us going in the right direction, we cannot wait until the end of the year to find out if we have been successful. Therefore, we must break down these annual goals into shorter-term objectives that represent a detailed list of steps through which the student must progress in order to reach each annual goal (White & Haring, 1980).

Our precisely defined goal, called a behavioral objective, contains three essential components: (a) the response we want the student to make, (b) the situation in which this response is to occur, and (c) the criteria we use to determine when the objective has been accomplished (Sulzer-Azaroff & Mayer, 1977). Let us examine each of these three components separately.

When we describe the response itself, it is imperative that we be as precise as we can. Otherwise, we may end up shaping a response other than the one we want. Therefore, we must specify the various behavioral dimensions of the response. First, we may want to specify the topography of the response, i.e., its form or shape. For example,

if we want a student to hold her fork in a certain way or to bring the food up to her mouth in a certain way, we need to specify the topography of the response. Second, the dimension of intensity may be important. When we have targeted verbal behavior, we may need to specify that the student must say a given phrase loud enough to be heard 3 feet away or softly enough not to be heard in another room. Third, the frequency of a response within a given time period may be important. For instance, we may want a student to run a comb through her hair at least five times rather than just once as part of her grooming routine. Fourth, we may be interested in the duration of a response, i.e., how long it lasts. When we design a program to teach a student how to brush her teeth, we probably will want to specify how long we want her to brush her teeth on each occasion, e.g., for one minute, not just for five seconds. Fifth, we may need to define the accuracy of a response, namely exactly what constitutes a correct response. If we are trying to develop a student's self-dressing skills, do we give her credit when she puts on her shoe by herself regardless of whether or not it is on the correct foot? And sixth, although infrequently, we may be interested in latency, the time between when a stimulus is presented and when the behavior occurs. For example, if we are teaching a student how to clean up after spills, chances are we will be interested in how quickly he responds when a glass of milk is spilled. Must he start to wipe up the spill within 10 seconds or will within 5 minutes do just fine? It is unlikely that all six of these behavioral dimensions will need to be specified when we write a particular behavioral objective. At least some of them will be important, however, so we need to be sure to analyze the desired

response and to decide which dimensions are essential.

The second essential component when writing a behavioral objective is to specify the situation or the conditions under which the desired response is to occur. Here we may include a statement of the setting, materials, or personnel. For example, we may be interested in trying to improve a student's mealtime behaviors. The question then becomes where will we work on these behaviors (e.g., in a separate room or in the regular lunchroom) and who will monitor the student's behavior (e.g., the teacher or an aide)? Particularly for the SPH population, we need to be specific when describing the situation in our behavioral objective. Because these students typically do not generalize newly acquired skills to novel settings on their own, there may be considerable variability in the extent to which they meet criterion depending upon the conditions under which we observe the behavior.

The third essential component of a behavioral objective consists of the criteria or standards for determining whether or not the objective has been reached. As pointed out by Baer, Wolf, and Risley (1968), the essential standard for determining whether or not a significant behavioral change has occurred is its practical importance. If there has been enough behavior change to satisfy significant people in the student's environment, the criterion has been met. A behavioral criterion typically includes a statement of the anticipated frequency of the response over time (rate) and how long it should persist. It is worth keeping in mind that the criterion level selected should not be the ideal level of the behavior, but rather, the minimum level that is acceptable.

As noted by White and Haring (1980), there is a certain aspect of

behavioral objectives that is often overlooked, namely, that mastery of an objective implies both accuracy (i.e., performing a skill correctly with a minimum number of errors) and fluency (i.e., performing the skill frequently enough or quickly enough for it to be functional). Therefore, truly useful statements of mastery require fluency criteria as well as accuracy criteria.

To include both sets of criteria, we may have several behavioral objectives written under one goal. The first objective would pertain to the acquisition stage of learning when we are interested in the student's learning to perform the skill accurately; we are not yet concerned about fluency. The second objective might still relate to the acquisition stage if we require more accurate performance of the skill (i.e., we are using a shaping procedure). If this requirement is not necessary, however, we can use the second objective to target fluency building. Once the student performs the skill accurately, now we want her to perform it more quickly. The third objective would again relate to fluency; we want the student to perform the skill even more quickly than before.[1]

How many objectives do we need under each goal? The number will depend upon how many objectives pertain to acquisition of the behavior (i.e., how many steps we have in our hierarchy of successive approximations) and how many address the fluency issue. A guide for determining the rate at which we want a student to exhibit a behavior is the ecological inventory strategy. By observing how quickly people

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[1]A changing-criterion design (see Kazdin, 1982, or Sulzer-Azaroff & Mayer, 1977) is useful for determining whether a student has acquired a skill and then for monitoring progressively higher (or lower) rates of performing it.

in the natural environment complete a task or emit a behavior, we can get an estimate of the ultimate mastery criterion and, therefore, would continue instruction until this rate is attained and maintained. This approach can serve as a useful guide for determining our aim, although it does not guarantee that we will be able to achieve this level of fluency for all behaviors with the SPH population.

Summary of Behavioral Objectives

After we have given careful consideration to selecting functional goals, we must break each of these down into specific behavioral objectives that clearly define the desired response, the conditions under which we will measure its occurrence, and the criteria for evaluating it. Several objectives can be clustered together with the first (or first several) aimed at increasing a student's accuracy and subsequent ones aimed at making the student more fluent in performing the behavior.

Practice Exercise 1: Goals and Objectives

In reviewing a student's IEP, we find the following annual goals. For each, decide if it is appropriate. Revise (or discard) it if necessary, then proceed in writing several behavioral objectives that address both acquisition and fluency-building issues. One set of responses can be found in Appendix C.

Goal 1: Marty will differentiate shapes.

Goal 2: Joseph will dress himself independently.

Goal 3: Rachel will identify colors.

Chapter 2

SELECTING OBSERVATIONAL SYSTEMS

In the previous sections we discussed behavioral goals and objectives. Since the behavioral objective includes a precise definition of the target behavior, a description of the conditions under which the behavior change is to occur, and the criteria for determining if the objective has been achieved, we have the beginnings of an effective measurement system. Once we have selected the dependent variable, the target behavior (expressed in quantifiable terms) that we are interested in changing, we must decide how we are going to measure it.

Types of Measurement

Severely and profoundly handicapped students are not going to progress just because we tell them to or hope they will. Really to know the level of their behavior before treatment and how well they are doing after treatment, we must measure students' performances as often as possible. There are a variety of ways to measure behavior; six of these are outlined below. Once we have determined our dependent variable, we usually measure it in one way, although sometimes we may want to measure it in two ways (e.g., take both frequency and duration measures of tantrums).

Measures of Permanent Product

If the behavior leaves evidence in the form of an enduring product, we have a permanent product. The number of boxes packed, of towels folded, of buttons buttoned, or of toys broken all can be measured directly, either as soon as they occur or later. If the

complexity of the tasks is kept constant, all we have to do is count up the number. Many behaviors are transitory, however, and cannot be measured after they occur; we must measure them as they are taking place.

Event Recording

Event recording is the number of times a behavior occurs in a given time interval such as 15 minutes, the lunch period, or the entire school day. Before event recording can be considered the appropriate measure, the dependent variable should be discrete, i.e., it must have a clearly definable beginning and end. Behaviors such as finger eating or object throwing are discrete whereas on-task behavior often is not. A second requirement before event recording can be used is that each occurrence of the behavior has approximately the same duration. For example, if temper tantrums were our target behavior and we wanted to count how many occurred in a day, we would have to be sure that we could recognize when a tantrum started and stopped and that each tantrum lasted about 2 minutes, 5 minutes, or whatever. If both of these criteria are not met (which is usually the case for this behavior), then event recording is an inappropriate measure.[2] A third consideration before using event recording is that the behavior not be

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[2]I found myself in some difficulty once when I was in the middle of an intervention for sib. I was working with an 11-year-old moderately retarded girl who bit her hands. I used event recording (I counted frequency of self-bites in each 10-second interval) and graphed the number of bites that occurred per 15-minute session. Her self-bites usually lasted about 2 to 3 seconds. Then one day I was amazed when Maria's bites were over 12 seconds long! The now unequal duration of the self-biting precluded my using event recording. Fortunately, I just switched over to partial-interval data that I automatically had by using this system and regraphed the data using this new method of measuring Maria's sib.

too high rate. If it occurs too rapidly, we cannot reliably count the number of times it occurs.

Task analyses are essential when we are dealing with interventions with the SPH population, and event recording is a convenient measurement system when using them. For your raw data sheet, list each of the subcomponents of the task down the left margin of the page and mark off spaces to the right. For each session, simply check off which parts the student performed. An example of such a data sheet can be found in Figure 5. A useful technique for graphing data from a task analysis is presented in Figure 6. Both of these figures are found in Chapter 3. Event recording can be done in many ways: with pencil and paper, with a reliable wrist counter similar to the one proposed by Lindsley (1968), with a hand counter (like the ones that are used to count how many people enter a building), by marking on masking tape on the wrist, or by transferring tiny objects (e.g., paper clips) from one pocket to another. An observer who is only taking data and not having to instruct students as well will probably use pencil and paper. If the teacher is taking the data while continuing to teach, a convenient system for him/her will need to be worked out.

Duration Recording

Duration refers to the amount of time in which a behavior occurs. Behaviors should be discrete before duration recording can be done. Stopwatches are particularly suitable for measuring duration because they can be stopped and started again, without resetting, to record total duration of a behavior for any given observation session.

Latency Recording

Latency refers to the elapsed time between a stimulus and when the

person begins to respond. For example, the teacher presents an instructional prompt, "Put on your hat." After 14 seconds, the student begins to put on her hat. Her latency of responding is 14 seconds. Although latency is not one of the more common measures, it can be very useful when determining how long it takes a student to respond to a request or to different types of prompts.

Interval Recording

For behaviors that are not clearly discrete, interval recording is appropriate. In such cases, event recording and duration recording would be difficult. There are two types of interval recording. In the first, whole-interval recording, the behavior must occur continuously throughout the entire interval before its occurrence is scored. Behaviors that occur for very short periods of time, such as blinking or throwing an object, should not be measured using whole intervals, whereas behaviors occurring for longer periods, such as working on an activity, could be. You can select the length of the interval you want; 10-second intervals are often used. If you used whole-interval recording and scored four out of the six intervals in a minute, you would know that the student had engaged in that behavior for at least 40 seconds (although it could have been for 58 seconds). Thus, whole-interval recording may be used to estimate the duration of a behavior; this measure provides a measure of the minimal possible duration.

In the second, partial-interval recording, the behavior only needs to occur for part of the interval for its occurrence to be scored. Whereas whole-interval recording will underestimate the occurrence of the behavior, partial-interval will overestimate it. The true level of the behavior lies somewhere between the two. Because each provides

different estimates of the behavior, we must be careful how we report our data. Thus, for example, we would need to say that Esther shared her tools in 40% of the intervals observed and not that she shared them 40% of the time. (In addition, you briefly will want to explain that this 40% is an under- or overestimate depending upon whether whole- or partial-interval recording was used.)

Although interval recording can be used to measure many behaviors, it should not be used for very infrequent behaviors. Keep in mind, too, that although you as a psychologist and outside observer could use this system with no difficulty, teachers cannot use it easily and continue to teach unless the observations are kept very brief.

A prerecorded tape indicating 10-second (or whatever your select) intervals is frequently used for interval recording. Two sample data sheets in which interval recording was used can be found in Appendix D.

Momentary Time Sampling

In recording the occurrence of a behavior using a momentary time-sampling system, we only observe at the end of the interval. We might observe for 1 second or for 3 to 5 seconds at the end of each interval. We can decide what we want to use and then must be sure to use that same amount of time to observe at the end of each interval.

Momentary time samples can be used for behaviors that last a while. If the behaviors are too brief in duration, the observer will miss the behavior altogether. In this behavior-recording system, the interval is generally longer (e.g., 15 minutes) than it is for whole- and partial-interval recording (e.g., 10 seconds). It is a useful technique for teachers who conduct instructional activities in addition to taking data. It is also a useful technique for taking data on

several students. At the end of the interval, the observer looks up at each student in turn and records the presence or absence of the target behavior. A definite disadvantage of the system, however, is that behaviors could be grossly underestimated, particularly if long observation intervals are used.

As an example of a situation in which you might use momentary time sampling, consider a student, Jeffrey, who drools a lot. You decide to use 10-minute intervals and observe him for 2 seconds at the end of each interval. At the end of one hour, you will have made six observations. If you observed drooling in two of them, you would interpret your data as follows, "Jeffrey was observed drooling in 33% of the observations made." You did not observe him drool 33% of the time because you did not take a continuous duration measure for the full hour.

Practice Exercise 2: Measuring Behaviors

The following examples are behaviors that have been targeted. For each, select the most appropriate way of measuring them and indicate the corresponding dependent variable. You may be interested in measuring some of the behaviors in more than one way. A set of responses can be found in Appendix E. They are not the only correct answers because different situations may make another measurement system more appropriate.

	Measurement System	Dependent Variables
1. food stealing:	_____	_____
	_____	_____
2. self-stimulation:	_____	_____
	_____	_____
3. folding clothes:	_____	_____
	_____	_____
4. getting dressed:	_____	_____
	_____	_____
5. compliance:	_____	_____
	_____	_____

Inter-Observer Agreement

Once we have selected target behaviors, operationally defined them, and determined our measurement system, we are ready to roll. Well almost. Before actually beginning to take data, we must ensure that our measurement system is reliable. We want two different observers consistently to agree on the behavior they observe; we do not want differences to occur in the dependent variable simply because people are not agreeing on when the behavior occurs. Therefore, it is extremely important that we demonstrate high reliability of our measurement by calculating coefficients of agreement. As noted by Sulzer-Azaroff and Mayer (1977), reliability checks should be made even before we take baseline data as well as during each phase (i.e., baseline and intervention phases). If our percentages of agreement are 90 or above, we have good reason to believe that our observation system is reliable. If the reliability coefficient drops much below 80%, we have some problems and must make changes before continuing. Poor inter-observer agreement usually means that we have not been precise enough in defining the target behavior, but we might also have observers who have not been sufficiently trained in using that particular observation system. For those sessions in which a reliability observer takes data in addition to the primary observer, try to ensure that they do not cue each other inadvertently (e.g., have them sit apart).

Inter-observer agreement can be calculated in several different ways. For measures of permanent product and interval recording, use

the following formula:

$$\frac{\text{number of agreements (A)}}{\text{number of agreements (A) + number of disagreements (D)}}$$

In determining the number of agreements, count the number of times in which the primary and reliability observers agree in their observations of the behavior. The number of disagreements is simply the number of times in which they disagree. Several examples for calculating coefficients of agreement using this formula are provided in Appendix F. For partial-interval data, three coefficients can be determined. Overall reliability is calculated by including every interval. Occurrence reliability is calculated by examining only those intervals in which one or both observers recorded the behavior. Nonoccurrence reliability is calculated by examining only those intervals in which one or both observers did not record the behavior. Because overall reliability sometimes can produce a spuriously inflated coefficient, by using it, we erroneously may think that we have reliable measurements when we actually do not. Therefore, you generally want to calculate occurrence reliability since we are primarily interested in making sure that we agree on when the behavior occurs. Nonoccurrence reliability is reported less often.

For event, duration, and latency recording, use the following formula:

$$\text{total reliability} = \frac{\text{smaller/shorter measure}}{\text{larger/longer measure}}$$

Several examples for calculating indices of agreement using this formula are presented in Appendix G. It is possible that the

coefficient we compute will be very high even though the two observers do not observe the same occurrences of the behavior. For example, suppose that Observer 1 counted six behaviors during the first 5 minutes of observation and zero behaviors during the second 5 minutes. Observer 2 counted zero behaviors during the first 5 minutes and six behaviors during the second 5 minutes. Using the above formula, their interrater agreement is 100% although they both did not count the occurrence of the exact same instance of behavior even once. Therefore, for greater precision in calculating total reliability, it is best to break your total observation period down into several shorter intervals. Thus, a 30-minute observation session could be broken down into three 10-minute intervals and three coefficients of agreement then would be calculated.

Training Observers

As the school psychologist, you will do many systematic observations of SPH students during your initial assessments and after behavioral interventions have been implemented. These observations also must be done by other school personnel such as teachers or teachers' aides. They are the ones who work with the student daily. Therefore, you must train these individuals in techniques of systematic observation. This task is not as ominous as it may appear at first. We want everyone working with this population to know how to take data, which may give us a sizeable number of people to train. But once we have trained them to take data for one student, we generally will need less time to train them to take data on other students.

The method you use to train observers will vary depending upon a number of factors such as the type of observational system involved and

the experience the trainees have already had in data collection. In certain settings, you may decide to focus only on certain specific observation procedures (e.g., a time sampling of work productivity). In other situations, you may want to address broader issues in addition to the particular observational system to be employed for that case. Reid (1982) provides a comprehensive framework for training observers. A modified outline of his model is presented below which may be useful for you in your efforts to train observers in your setting.

I. Observer Orientation

A. Purpose of Taking Data

1. To measure present level of behavior (how much of a problem is it or is it really even a problem?)
2. To measure how much behavior change occurs after intervention has been implemented.
3. To understand precisely the specific behavior we have targeted.

B. Precise Data

1. Should be objective (unambiguous definition of behavior that requires little inference and personal interpretation).
2. Should be reliable (observers use system in same way).
3. Should be valid (observations actually do measure behavior they are intended to measure).
4. Necessity during training for highly detailed instructions (otherwise, when observers are confronted with behavioral sequences they have not dealt with during training, there is a much greater risk of idiosyncratic recording

decisions that will decrease reliability).

5. Reduce bias (as the trainer, try to avoid letting observers know your hypotheses about the behavior; do not praise them for collecting positive data, but rather for taking accurate data, even if these data are not what you want to see).
6. Activity: Have trainees attempt to record behavior prior to training; this exercise will underscore the need for systematic training with a structured coding system.

II. Training in Specific Observational System

A. Materials

1. Present and explain observation forms (i.e., data sheets) and recording devices (e.g., frequency counter).
2. Discuss observation manual (if there is one).

B. Analogue Coding

1. Begin by exposing observers to simple or to artificially simplified behavioral sequences (we call this procedure graduated training; what we are trying to do is shape the observers' behavior).
2. Present all the coding categories in training (if observers are to take data on several behaviors).
3. Behaviors presented in training eventually should be complex and unpredictable.

C. Criterion

1. Train observers to 100% agreement using precoded protocols of analogue sequences (i.e., "overtrain" them).
2. Have observers recode training segments until this

criterion is reached.

D. Length of Sessions

1. Observational training sessions should be short to begin with (focusing on accuracy of observation).
2. Length of observational training sessions should be increased gradually until length equals that of real sessions (focusing on speed and endurance in taking data).

E. Feedback

1. Immediately after each training segment, review observation protocols and discuss errors (be sure that all observers are present to hear this feedback). Also be sure to discuss correct recordings to ensure that observers are using the operational definitions of the target behaviors correctly. For example, for self-injurious behavior, two observers may have agreed on its occurrence although Observer 1 coded it when the student took any object and struck it against her head, and Observer 2 coded it only when the student used her hand to strike against her head.
2. After each coding session, the observers should be debriefed to ensure that they have not modified the operational definitions over time.
3. In addition to emphasizing accuracy in recording, stress speed and endurance in taking data. (In other words, we are interested in fluency building in addition to acquisition).

III. Training in Actual Observation Setting

A. Prevention of Observer Drift

(Observers may drift away from correct use of observational coding system by gradually changing their definitions of the target behavior, yet still have high reliability).

1. Observers should not be able to watch each other as they take data (e.g., they should sit on opposite sides of the room during in-vivo training and actual data collection).
2. Observers should not discuss disagreements or different coding sequences unless in the presence of the trainer and all other observers.
3. To maintain validity as well as reliability, the criterion observer (i.e., the trainer) should take data simultaneously with the trainees.
4. Immediate calculations of inter-observer and criterion agreement should be made and discussed after each observation segment.
5. Review sessions and quizzes on definitions of target behaviors should be conducted regularly.

B. Observer Bias (see part I-B-5 of outline)

1. To the extent that it is possible, keep observers blind to phase of study (e.g., baseline, treatment, or follow-up).
2. If data are taken on several students, only some of whom have received treatment, try to keep observers from knowing which students are controls and which received the intervention.

C. Reactivity

1. Point out to observers that their presence in observation

setting may distort the validity of the data.

2. Present guidelines about personal appearance and behavior so as to reduce student reactivity. (Note: In general for the SPH population, concerns about reactivity are minimal, although they may be important for your particular situation.)

3. Allow for an adaptation period if necessary (when student has gotten used to observers and behavior has stabilized to point that you have a fairly representative baseline measure).

IV. Assessment of Observer Performance After Training

A. After Initial Training

1. Even if observers reach acceptable and stable levels of reliability and criterion agreement during training, their performance can deteriorate quickly if their observations are not monitored after training for agreement with the trainer.

2. Size of this decrease in accuracy is related to complexity of observational system.

B. To Maintain Accuracy

1. Data collected by observers are more reliable and accurate when they know they are being monitored. Therefore, spotchecks should be conducted on an irregular schedule that observers cannot predict. This assessment provides information on quality of data and when retraining is necessary.

2. Overtraining (see part II-C of outline), which requires

error-free data collection, helps prevent observer drift. Do take the time at the beginning to overtrain observers.

3. Periodic drill and retraining for all observers is necessary. Each time observers encounter a novel behavior pattern, there is a potential for observer drift. In addition, target behaviors that occur infrequently may be forgotten or distorted over time.
4. Since pairs of observers tend to develop idiosyncratic techniques of data collection, rotate observer teams (e.g., try to have different people take reliability data).
5. Restrict reliability calculations to those who do not collect the data.

One final note is important to make in regard to data collection. Although there are a number of ready-made coding systems available, try not to be tempted to use them if they really do not suit your purposes. Most of the time you will end up devising your own system for collecting data. Remember, begin with the simplest observational system that you can that will allow you to get objective, reliable, and valid data. If it is too complex, no matter how much super information you could get, you may end up with nothing because those individuals working directly with the student do not take any data.

Formative Evaluation

Howell, Kaplan, and O'Connell (1979) discuss two general types of evaluation procedures, summative and formative. Posttests are summative in that evaluation occurs only once after teaching and learning have taken place. Summative evaluation is designed to measure

the end result of instruction. In contrast, formative evaluation is done frequently and measures learning as skills are being performed. Because the summative approach provides after-the-fact evaluation, we might realize too late that certain methods or materials were not as effective as we thought they would be. On the other hand, evaluation that occurs as skills are being developed is well suited to the educational needs of teachers and students because it allows us to detect potential problems more rapidly. Formative evaluation gives us a way to evaluate a student's growth as it is occurring. This frequent and up-to-date feedback, because it allows us to detect when an intervention is not working well for a particular student, will enable us to make earlier changes in treatment procedures which in turn will lead to much more rapid student growth. It is particularly useful in measuring a student's progress toward objectives and not just whether or not he met our aim by the predetermined date. Thus, what we want is to measure behavior frequently (preferably daily) and to use our assessment data to guide our interventions. Assessment and intervention are clearly intertwined; providing systematic interventions that are responsive to students' needs is impossible without frequent assessment of their behaviors.

Recording Behavioral Data

We have already outlined different types of measurement systems we can use to take data on a student's behavior. Once we have determined our measurement system and trained the observers, we need to decide when and for how long we want to observe a student. To begin with, we must take data before we begin a formal and systematic intervention for two reasons. First, we need to estimate what the true, representative

level of the behavior is. Relying on indirect data gathered from records or interviews is insufficient; the behavior may have changed since it was first described in school records, or people who work with a student inadvertently may have under- or overestimated the behavior. Second, we must know the pretreatment level of the behavior in order to measure how much behavior change occurred following our intervention. Since behavior may be affected by the presence of observers and rarely occurs at a consistent rate (unless it is zero rate), we should take data over an extended period of time. Considering that the initial data we take on a student may not be typical, the period of adaptation to a new environment (e.g., presence of observers or new school setting) should pass before the baseline phase is formally initiated. During this adaptation period, a student's behavior might be better or worse than it usually is. Once adaptation has occurred, we can begin a baseline (typical pretreatment level of behavior) assessment. As noted by Sulzer-Azaroff and Mayer (1977), it should continue until we have identified the outer limits within which it fluctuates (i.e., the highest and lowest levels at which the behavior occurs). In addition, baseline data should continue to be taken until the trend in the data is going in the opposite direction to what we want (e.g., take baseline data until there is a downward trend when you are interested in increasing self-help skills). Baseline data are usually taken for at least three sessions when the behavior occurs at a zero level and for at least five sessions or longer if necessary when the behavior occurs at a higher level. As a school psychologist, you will encounter times when you cannot get as much baseline data as you really should have. Try to explain the importance of obtaining such pretreatment data and

to get at least a few data points, and then accommodate to external constraints (i.e., compromise when necessary).[3]

With the SPH population, we will have numerous behavioral objectives for each student. To ensure that we determine the typical and representative level of behavior and that we detect when programmatic changes are necessary in an intervention, we will adopt a formative-evaluation approach. So what do we do with all these data? Clearly, the first step is to write them down; there is much too much information to keep in our heads. Therefore, after taking data (which is recorded on the observation sheet), it is a good idea to transfer the session's data onto a summary raw data sheet which White and Haring (1980) refer to as a "daily assessment record sheet."

Initially, all you need to do is set up the headings which will include condition (e.g., baseline or treatment phase), session or day, and raw data. It is also desirable to include space for reliability data to be recorded as well as space for record floors and ceilings (to be discussed shortly) where applicable. In addition, I like to leave several lines blank between conditions to summarize the data (e.g., range, mean or median, and trend). These summary data per phase will be helpful in evaluating the effectiveness of an intervention and in writing up results in a psychological report. An example of a summary raw data sheet can be found in Appendix H.

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[3] In most situations, take pretreatment data over an extended period of time to allow for adaptation to occur and to get a representative baseline level. However, for extreme cases such as very severe self-injurious behavior, you are ethically bound to attempt an intervention as soon as possible. Therefore, you may want to take baseline data for only one session or even to estimate the level of behavior from verbal report of people who have worked with the student.

Variables Affecting the Validity of Behavior Change

When data are taken and we compare a student's behavior in one session to her behavior in another, we may see differenes that are a function of the way we took the data and not of the student. Our data will be confounded and we will not know if changes in the student's behavior are real or a reflection of changes in the situation. Therefore, it is essential that we ensure that the student's freedom to respond and opportunity to respond are consistent across observations.

According to White and Liberty (1976), there are two questions we should ask ourselves when we are comparing two behavior counts. The first is whether or not a student was as free to respond in the first instance as in the second. In other words, was there anything pacing, prompting, or inhibiting her in one situation, but not in the other? For example, suppose we target Rachel's food stealing during lunchtime and begin to take baseline data. On the first day we count seven episodes of food stealing. This number is quite a lot when a teacher has several other SPH students in his lunch group. Therefore on the second day, the teacher put Rachel at an adjacent table and had the aide monitor her. The effect of this modification was to inhibit Rachel's freedom to steal food; her food stealing on that day was two. Although it would appear (by examining the data) that Rachel's food stealing was decreasing, it actually was a change in the environment that accounted for the apparent improvement. Generally it is best to create situations in which the student is free from external constraints while responding. Only when the student is free to respond at her own pace can we assess the effectiveness of program variables. If constraints do exist (as will often be the case for highly

disruptive behaviors), these need to be recognized, described, and kept as consistent as possible across baseline and treatment phases.

The second question we need to ask when we are comparing two behavior counts is whether or not the student has an equal opportunity to respond in both instances. For example, suppose that our dependent variable was the number of independent steps Joshua completed in dressing himself. We are in our third week of training and have found improvement in his zipping and buttoning skills. Then one day the weather is particularly warm, so Joshua puts on a T-shirt (thus eliminating the necessity to button his shirt) and a pair of elasticized shorts (thus eliminating the necessity to zip his pants). By examining the data, it looks like there has been a dramatic drop in his dressing skills. This behavior change can be explained entirely by an environmental variable, namely, a decrease in Joshua's opportunity to respond. In general, it is best to allow student the same number of opportunities to respond in each session. For example, if we conduct individual treatment sessions with a student to increase his compliance, we could present 20 requests at each of the sessions.

For situations in which it is not possible to provide a constant number of opportunities, use percentage rather than frequency of correct responses. If we do use percentages, there are two problems that may affect how we interpret our data. First, if the total number of possible opportunities (i.e., the denominator) is less than 20, a change of only one correct response will make it appear that there has been a significant change in the level of the dependent measure. For example, if a student sorts four out of eight pieces of clothing into the appropriate dark or light pile for laundry, he has completed 50% of

the task correctly. The next day he appropriately sorts five out of eight items and thus completes 62% of the task correctly. When we examine our graph, this improvement from 50% to 62% looks impressive. We must remind ourselves that the student did make an improvement, but only by a single response that may have even occurred by chance.

A second problem in using percentages is that sometimes it is impossible for a behavior to stay at a consistent level even when no new learning has taken place. For instance, Danielle typically pushes in half of the chairs after lunch. On day 1, there were 12 people at lunch and she pushed in six of the chairs. On day 2, there were only 11 people, and thus, only 11 chairs. Obviously, Danielle cannot push in exactly half of these chairs (i.e., 5-1/2). She can push in five or six of them, yielding percentages of 45 and 55 instead of 50 from the day before. Although use of percentage rather than frequency of chairs pushed in is necessary since the opporunity for Danielle to respond is not constant across days, it can be misleading. In this example, the data indicate that there was a decrease (50% to 45%) or an increase (50% to 55%) in Danielle's behavior which largely could have been due to a measurement artifact rather than to a real change in her behavior.

Conventions in Graphing Data

In adopting a formative-evaluation approach, we will measure student behavior frequently and record data on a summary raw data sheet. Our next step is to graph the data. This visual display of the data allows us quickly to evaluate the effectiveness of the intervention and the progress the student is making. We can see how much behavior change has occurred, by evaluating the present level of the behavior against baseline, and whether or not the rate of progress

is sufficient for the aim to be met. It is important to graph data immediately after an assessment has been completed or at least before the next assessment is done. We use the graph daily to make timely decisions about a student's program. (Remember, this feature is one of the major advantages of formative evaluation.) Therefore, do not wait to graph the data until the end of the week; otherwise you may be too late to make the right change at the right time in the intervention, and the student's behavior could deteriorate. In this section, standard graphing conventions are presented. Evaluating the degree of behavior change is covered in the next section.

Labeling the Ordinate and Abscissa

It takes time and careful consideration to develop a functional graph. First of all, we need to consider how the graph shows the passage of time. We use the abscissa (horizontal x-axis) to indicate either days or sessions in which we took data on the student's behavior. The ordinate (vertical y-axis) indicates the scale for measuring the dependent variable (i.e., the target behavior). If two or more assessments are made in one day, you will label the abscissa "Sessions." Results from each assessment are plotted on the next space. If several days are skipped, data from the next assessment are still graphed on the next available space. In Figure 2, we had no choice but to use sessions because our feeding intervention to increase a student's acceptance of vegetables occurred for two meals a day.

If we make only one assessment of a target behavior a day, you can still use sessions, but you also have the option of labeling the x-axis "Days," "Consecutive Days," or "Successive Days." If an assessment is not made one day, you leave that space blank on the graph. If data are

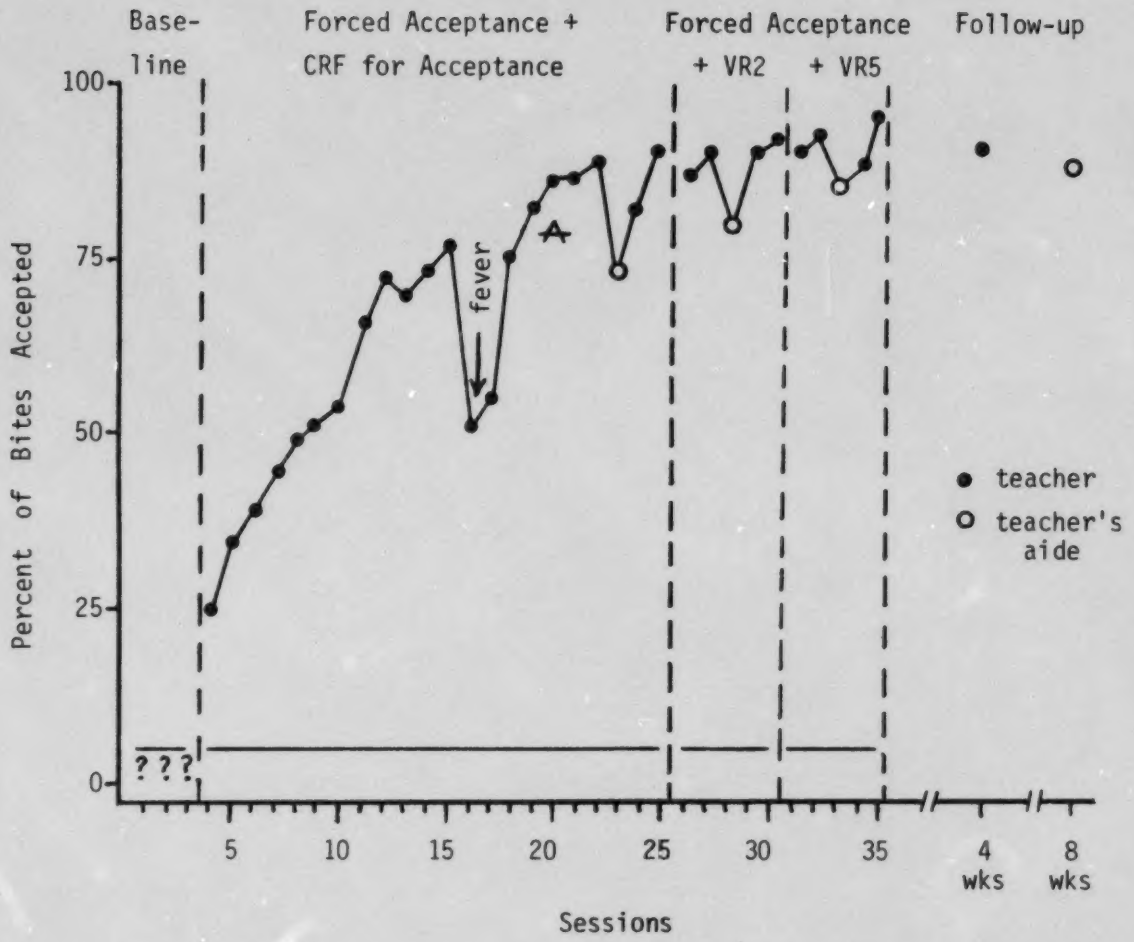

Figure 2. Percent of bites of vegetables accepted during baseline and treatment conditions.

taken only on week days, you would leave two spaces blank for Saturday and Sunday. Once we have drawn our data points on the graph, we connect them with straight lines which helps us to see the overall trend in the data. When we have used sessions, we continue to draw lines connecting all data points (except through phase-change lines) so that there are no gaps in our data. When we have used consecutive

days, there are two ways in which the data points can be connected. These are illustrated in Figure 3. White and Haring (1980) suggest that we connect data points only for assessments in which no days have been skipped. For data taken only on week days, then, we would connect data points for assessments made on Monday through Friday, but not for Friday to the following Monday. Another way to connect data points when days are used is to draw a special line between the Friday and

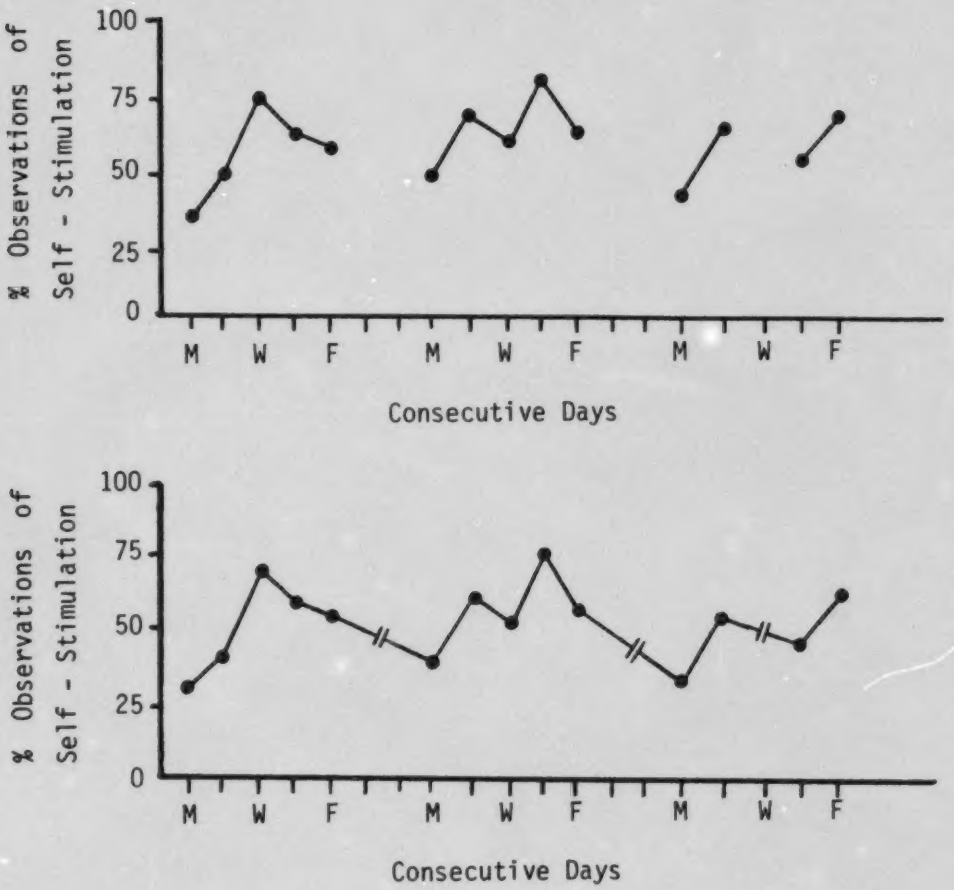

Figure 3. Variations in graphic presentation of missing data.

Monday points; it is a straight but discontinuous line with short double lines at the break (—//—). This method is frequently found in the professional literature. You may use either method.

When we conduct several assessments per day of a particular target behavior, we have no choice but to graph it by sessions. When we have only one assessment per day, we can either graph the data by sessions or by calendar days. If we plot by sessions, we can get more data onto one graph; we thus save considerable space. With days however, White and Haring (1980) point out that it is easier to see how absences and holidays affect a student's progress. In addition, it is easier to tell how many days we assessed the student and how many days we let slip by. (This latter point is especially important after we have started an intervention.) An examination of Figure 3 reveals that Frank's self-stim is lowest on Mondays, his first day back to school after two full days at home on the week end. We might not have noticed this pattern if we had plotted the data by sessions; therefore, we may have lost information that may have had implications for treatment.[4] Another advantage to graphing our data by calendar days is that we easily can compare data on different target behaviors. For each of our graphs, then, we can list dates along each graph consistently. If we start taking baseline data in the 10th week of the school year, we

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[4] After noticing this pattern in the data, first of all, we would want to find out what was happening at Frank's home on week ends that might lead to a reduction in his self-stimulation. Perhaps he has a lot of interaction with people or is involved in more activities. If we find these to be true, we might consider enriching our school environment so that Frank has little time to be idle (modification of antecedents) and using a DRO procedure in which we reinforce Frank for any behavior <u>other</u> than self-stim (modification of consequences).

begin charting on the 10th week of the chart. Although portions of the graph will be left blank, because there is this consistency in all the student's graphs, we quickly can determine when a program was started and when changes were made. And by overlapping one graph on top of another, we can see the effect that a change in one program might have had on other behaviors. For example, I started an intervention for noncompliance in a 3-year-old moderately retarded boy and continued to take baseline data on his object throwing. Because I had consistency in the way calendar days were labeled, it was apparent that as compliance began to increase, the object throwing started to decrease.

Indicating Different Phases

After we have taken pretreatment data, which includes an adaptation period and baseline phase, we can begin treatment phases. To separate baseline from treatment conditions and treatment conditions from each other, we use a phase-change line which is a dashed vertical line drawn half way in between the last baseline data point and the first treatment data point. They can be seen in Figure 2. Do not connect data points across phase-change lines since the conditions under which the data were collected are different. A phase-change line will be used for each condition which you label at the top of the graph (e.g., baseline, DRO + extinction, time out, etc.)

Acceleration and Deceleration Aims

When we begin any intervention, we should always have a definite aim in mind; in other words, where do we want the student to end up? To indicate the aim on the graph, we need to know the desired level of the behavior (from y-axis) and the date by which we want it to be attained (from x-axis). At the intersection of these two, we draw in what White

and Haring (1980) refer to as an aim star. If we are trying to increase a behavior, such as rate of signing, we have an acceleration aim which we indicate on the graph with the symbol, "A". In Figure 2, the acceleration aim indicates that we want the percent of bites accepted to be up to 80% by the 20th session. Deceleration aims, when we want to decrease a behavior such as toileting accidents, are indicated by the symbol "A".

As we progress with our intervention and begin to see a trend in the data, we can determine if we will meet our aim with the present rate of the student's progress. We can estimate the trend and whether or not the student will meet the aim by "eyeballing" the data. However, with variability in the data, this technique can be misleading. For greater precision in determining the extent to which sufficient progress is being made, you can use the split-middle technique (see White & Haring, 1980, pp. 331-336, or White & Liberty, 1976, pp. 64-69.) If the rate is not sufficient to meet the aim, we either have set an unrealistic aim, or we have an intervention that is not as effective as it needs to be. In this case, we have two options. First, we can continue with the same intervention. If the student does not meet the aim by the date specified, simply place a new aim star further to the right on the graph which will allow more time. Second, we can modify the intervention in an attempt to bring about more rapid behavior change and thus meeting the aim.

Record Floors

Obviously, our main interest on the graph is the data. But because there are always limits on how accurately we can assess a student's performance, it is desirable to put record floors and record

ceilings directly on the graph. Record Floors are the lowest possible non-zero values that our assessments can take (White and Liberty, 1976). For example, with 10 items, the percentage gaps between possible scores are 10% (at least 1 response out of 10 is 10%). The student's lowest possible score, other than 0, is 10%. If we had a situation in which we used a rate measure and we allowed 5 minutes for the student to respond, our rate gaps would be .2 responses per minute (at least one response in 5 minutes is .2/min). In this case, the student's lowest possible non-zero score is .2. The 10% and the .2 are the record floors. They each define the lowest score (other than 0) that may be measured in our assessments of the student's behavior and the least amount of change that must occur in the student's behavior before our measurement system will detect it. In Figure 2, the record floor is 5% since 20 bites are presented to the student. The lowest possible value is 1 out of 20 or 5%.

Consider a situation in which there is an SPH student, Laurel, with poor motor control. One of the goals is to improve her self-help skills, so the teacher targeted self-feeding and used shaping and chaining procedures to teach Laural to use a spoon to feed herself. The teacher also adapted the plate by putting a 2-inch rim around half of it. You, as the school psychologist, become involved in the case 2 weeks after intervention began and decided to use event recording to measure the behavior; the dependent variable was the number of bites taken independently. During the first observation session, you observed Laurel use her spoon to get her food; but before she could get the spoon up to her mouth, the food fell off. For 5 minutes, Laurel repeatedly (albeit slowly) scooped food up with her spoon, but was not

successful in actually taking one bite of food independently. Your data point for that session is 0 which amazes the teacher who has been delighted with Laurel's progress. The problem lies in the measurement system. Our data suggest that Laurel had no independent self-feeding skills when actually, she did have some. Unfortunately, the skills she did demonstrate fell below the record floor. Therefore, what is needed is to lower the floor which can be done in two ways. First, we can extend the time period in which the student has to respond. In other words, give her more time and then the response might occur.[5] It is unlikely that giving Laurel more time would help much. A second way to lower the record floor, therefore making our measurement system more sensitive to changes in her behavior, is to provide more opportunities to respond. We could divide the present dependent measure into three parts. Therefore, instead of just having one response equal to one bite taken, we could divide it into three parts (e.g., putting food on spoon, lifting spoon up to mouth, and placing food in mouth). Lowering the record floor in this manner increases the chances of recording some of Laurel's behavior as something other than 0. In the first observation session, then, you would have been able to record <u>at least</u> a 1 or a 2 and probably more than that if you added these up for every time she put food on her spoon or lifted it up to her mouth. This

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[5] If we want a rate measure, i.e., how many bites Laurel takes in 1 minute, we could observe her for 5 minutes. If she took one bite during this interval (which is the lowest non-zero number of bites she could take), the record floor would be .2 bites/min. If we extend the interval to 10 minutes, which gives her more time in which to respond, the record floor would be .1 bite/min. Thus, our measurement system is more sensitive and can detect lower rates of Laurel's behavior.

revised measurement system provides us with a much more accurate representation of Laurel's performance level, and over time, a more accurate measure of her progress.

After designing a measurement system, if you find that many of the student's behaviors are at a zero level, the record floor may be too high. You may need to modify the system in order to lower the record floor. Because of limitations inherent in any system, there may be occasions in which the student's behavior falls below the record floor. The question, then, is, how do we plot these data? Instead of graphing the student's performance as 0, White and Haring (1980) recommend that we put a reminder directly on the graph that these performances do not necessarily mean that no behavior occurred, but rather, only that the student's performance fell below the record floor. To indicate this reminder, chart the record floor on the graph as a dashed line across each assessment session/day. If assessments are made daily and the record floor is always the same, you can chart it as a solid line extending from Monday to Friday of each week. Any assessments that fall below the record floor are called no-count data, and we graph them as small question marks ("?") just below the record floor for that session where we ordinarily would put the data point at 0. Three such data points appear in Figure 2. By following this convention, you make it very clear to yourself and to others that there are limits in the ability to measure a student's behavior.

Record Ceilings

In addition to record floors and no-count data, it is desirable to plot record ceilings, again by using a horizontal dashed line, directly on the graph. Record ceilings are the highest possible values that our

assessments can take. They are not indicated in Figure 2 because it is obvious that the record ceiling is 100%. For example, if we design a buttoning program to teach Edwin to button his shirt, the record ceiling might be five if there are five buttons on his shirt. Suppose we examine his data and note that on one day, he only buttoned four. Is the behavior beginning to deteriorate? We asked the teacher's aide about it and he indicated that Edwin's shirt only had four buttons that day. For this day, then, the record ceiling was four; had it been indicated on the graph, there would not have been this confusion.[6] The charted record ceiling serves the same function as the charted record floor; it reminds us of the limits our assessment procedures impose upon the range of the behaviors we can measure. If possible, it is best to set up situations in which the student will never quite be able to take advantage of all the opportunities to respond (White & Haring, 1980; White & Liberty, 1976). If we want to determine Matthew's rate of putting silverware away in a 5-minute period, we would want to provide access to more silverware than we think he could put away now or even after his rate had increased.

Usual or Significant Events

Occasionally there may be an unusual event, such as illness or significant change in routine, that might have affected a student's performance. It is a good idea to make a note of these on the graph

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[6] When graphing data, we should not use a frequency count unless the number of opportunities to respond or time in which to respond is constant for all assessments. Otherwise, we must use percentages (e.g., percent of buttons buttoned) or a rate measure (e.g., number buttoned per minute). For Edwin's data, a frequency count was set up because we thought that all of his shirts had the same number of buttons. On the one day when he wore a shirt with a different number of buttons, we should be sure to put this new record ceiling directly on the graph.

because they can be helpful in explaining any aberrant data (or even that the event did not effect a change in behavior). In Figure 2, we made note of the student's fever during the 16th session which adversely affected her behavior. Your two chief considerations in deciding to note something is whether or not it is relevant and the extent to which the graph becomes cluttered.

Additional Graphing Conventions

There are four additional graphing conventions that will facilitate clear communication of the data. One, if you want to put more than one set of data on the same graph, use different symbols and different lines to connect the data points for each. We also must provide a key so that we know what each stands for. Typically, the first choice for a symbol is a closed circle with a solid line to connect data points (●——●). A frequent choice for a second symbol is open circles connected by dashed lines (○--○). Having one circle closed and the other open provides contrast so that we can differentiate the two easily. If the two behaviors you are measuring have the same value on the same day, you may superimpose them by using a symbol that combines the two (◑). In Figure 2, two symbols are used even though we are only measuring one behavior. They refer to two different people who are doing the intervention. It is a very useful technique to use since these probes (of the aide's doing the intervention) help us to determine the extent to which the student has generalized and will accept food presented by a different person.

Two, hash marks indicating sessions or days (on the abscissa) and levels of the dependent variable (on the ordinate) should be pointing outward away from the central area of the graph. Following this

convention will provide more space for your data, particularly when there are low levels of the behavior. If we had not followed this procedure in Figure 2, our hash marks would have partially covered our no-count data during baseline.

Three, whenever some of our data fall below the record floor (or on the zero line if you are not using record floors), it is helpful to extend the zero point of the ordinate upward as was done in Figure 2. Otherwise your data will fall squarely on top of your abscissa and will be difficult to decipher.

Four, omit dead space on the ordinate to save space. For example, if our data on Megan's self-stimulation ranges from 58% to 93% of the observations made (a time sampling was conducted), we could eliminate the values on the ordinate between 0% and 50%. We indicate the break on the y-axis with the following symbol:" ≷ ". When we do not take data for an extended period of time because of the student's absence or a termination of the intervention before follow-up, we can omit dead space on the abscissa and indicate the break by marking two short parallel lines directly on the x-axis (—//—). Examples of both types of omitting unnecessary space are illustrated in Figure 4.

Summary of Graphing Conventions

Data taken throughout an intervention for an SPH student typically are presented on graphs. Conventions for graphing data were presented in this section. The major points to remember are the following:

1. Graph data as soon as possible.

2. Always place the scale for the dependent variable (i.e., the target behavior you are measuring) on the ordinate.

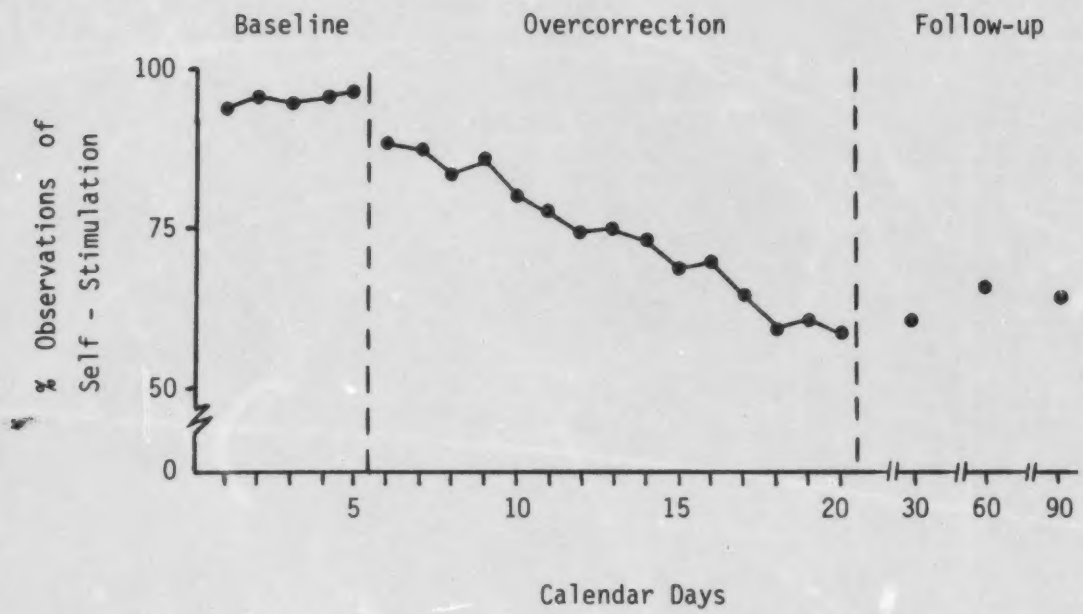

Figure 4. Conventions for indicating ommissions in ordinate and abscissa.

3. Always use the abscissa to indicate the passage of time, either by sessions or days. For graphs in which you use days, try to start each of them with the same calendar day so that comparisons of different treatment programs are possible.

4. Put the aim star directly on the graph and use it to help you decide if you need to modify your intervention.

5. When appropriate, indicate record floors and ceilings directly on the graph to remind people of the limits of your measurement scale. During baseline, if a student is performing on or below the floor or at or above the ceiling, modify the system to lower the floor or to raise the ceiling. It is especially important to determine record floors for percentages and rates.

Practice Exercise 3: Determining Record Floors and Ceilings

The following are examples of measurement systems that were selected for various target behaviors. For each, determine the record floor and ceiling that you would label on a graph. Answers can be found in Appendix I.

1. We are interested in the percent of time that Rebecca looks at her teacher when her name is called. The teacher calls her name five times for each session.

2. We use partial-interval recording to measure aggression. We select 10-second intervals and observe for 15 minutes.

3. We use a time-sampling procedure to measure how often Jones is working on his pre-vocational task. We observe once every 15 minutes for a period of 1 hour.

4. We are interested in increasing Julianne's spontaneous verbalizations and decide to use event recording throughout the entire day.

5. Jason's job before lunch is to put the napkins on the table. He has 5 minutes in which to place one at 20 settings. We want to know his rate per minute.

6. Catherine's daily job is to carry the clean linen back to her room and to the rooms of the eight other people on her hall. We want to know how many times a day she does this job without dropping the laundry.

Evaluating Behavior Change

In designing interventions for SPH students, obviously we are interested in changing their behavior by increasing or decreasing it or by teaching them new skills. Not only do we want to know the level of behavior (i.e., where the student is currently functioning), but also the rate of behavior change (i.e., how fast the student is improving).

Absolute Change

White and Haring (1980) and White and Liberty (1976) present two ways of measuring change. The first is absolute change in which growth is expressed in terms of how much is added or subtracted to a level of behavior. It is determined by subtracting the measure obtained at a previous assessment from the measure of the next assessment (e.g., taking yesterday's data point and subtracting it from today's). To graph absolute change, we use equal-interval graph paper (i.e., "regular" graph paper) that has equal distances on the ordinate between levels of the dependent variable. For example, Monday morning Gretchen buttoned 1 button per minute; Friday she buttoned 3 per minute. The absolute change is 2 (3-1). After another week of intervention, we examine the data and see that her buttoning improved from 3 on Monday to 5 on Friday. Again the absolute change is 2 (5-3). It appears that our program continues to be effective. However, we must be careful not to make erroneous conclusions. There are different ways of evaluating the data; some are more accurate or representative than others under some circumstances. A difficulty with the equal-interval graph is that it can make it appear that the rate of behavior change is as good at one point in the intervention as it is at another. In the above example, growth in week 1 looks as good as growth in week 2.

Proportional Change

A second way to examine the amount of behavior change that has taken place is to calculate relative or proportional change. It is found by dividing the larger performance measure by the smaller and then by labeling the change as "x" (times) or "÷" (divide) to indicate whether there was an increase or a decrease in performance. To graph proportional change, we use ratio or logarithmic graph paper in which proportional differences in values on the ordinate have equal spaces between them (see Appendix J). Thus levels of the dependent variable get closer together as the rates they represent increase (i.e., as you move up the ordinate). Consider the above example about Gretchen. We calculate the proportional change in her rate of buttoning during the first week as follows: 3 ÷ 1 = x3. The "x" indicates that the change was up. Instead of simply saying that Gretchen's performance increased by two buttons (absolute change), we can say that her buttoning rate increased three times. By making these types of change statements, we keep the size of the change in proportion to the original performance. During the second week, the proportional change in Gretchen's buttoning is 5 ÷ 3 = x 1.7. Using these relative-change statements, it becomes apparent that Gretchen's most recent change (x1.7) is less than her change during the first week (x3) because her being able to button two more buttons when she has started at three is a smaller proportionate increse than her being able to button two more buttons when she started at only one. When we consider relative change, the effectiveness of our training program is actually decreasing.

Programmatic Decisions

According to White and Haring (1980) and White and Liberty (1976),

in most cases, we should look at a student's proportional growth which will provide a surer foundation for educational decisions based on the student's real needs. Examining relative-change statements are especially important when the continued effectiveness of a program is being assessed over a long period of time. This method of evaluating behavior change is particularly suitable for SPH students since those with low rates of performance do not have to make large gains in absolute terms in order to show that an intervention is working. When their programs are first started, they only need to make good gains in proportion to where they were during baseline. With any program, eventually a student's performance will level off. When this slowing down occurs, it may be because the student has reached the limit of her abilities. We also should keep in mind that the ceiling may have been imposed by the program because of limits on the opportunity to respond (e.g., there are simply no more buttons to button). In addition, motivational variables may be relevant (e.g., once the student attains functional buttoning skills, there really is no good reason to button any faster). It is difficut to decide when behavior change has slowed down enough to warrant a change in a program. However, when we have determined proportional measures of change, the point where the ceiling is approached is usually marked by a quick drop in the relative-change statements. In general, the point at which a program should be changed is much more apparent.

There is another significant advantage to using ratio charts; namely, they make it possible to record behavior rates from .000695 behaviors/minute (one behavior in 24 hours) to 1,000 behaviors/minute. Because of this wide range, virtually all behaviors that might interest

a teacher can be charted in one standard format which makes comparisons between different interventions for a student easy to do. With the traditional interval scales, there is simply no way to show wide variation in performance rates on the same graph while still being able to see changes in behaviors.

In summary, the kind of graph paper to use will depend upon the measurement system for each target behavior. When you use time sampling, interval recording, duration or latency recording, use equal-interval graph paper. Much of the data you collect on SPH students, however, can be converted to rate such as measures of permanent product and event recording. When you have rate measures, use ratio graph paper such as White and Haring's (1980) "Standard Behavior Chart" which can be found in Appendix J.[7] It covers 20 weeks which means that only two charts are necessary to record data on a target behavior for one school year or three charts for a full calendar year. For practice exercises in graphing rates using this logarithmic scale, see chapter 4 in White and Haring (1980), pages 86-89.

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[7] O. R. Lindsley's original version of the Standard Behavior Chart can be ordered from: Behavior Research Company; Box 3251; Kansas City, KA 66103.

Chapter 3

GENERAL TREATMENT PROCEDURES

Once we have identified long-range goals for a student, broken them down into behavioral objectives, selected a measurement system, trained observers, gotten through the adaptation period, and taken baseline data, we are ready to begin a treatment program. Information needed to plan an intervention is gathered, in part, from the situational analysis, and is based primarily on knowledge of principles of applied behavior analysis. If a student already knows a skill, we can increase it by using contingent reinforcement. If the student does not know the skill, obviously, we must teach it to her. In this section, the use of reinforcement and techniques for teaching behaviors are reviewed. In addition, procedures for reducing inappropriate behaviors are presented. An especially crucial issue in designing interventions for the SPH population is planning for generalization and maintenance. Techniques to facilitate persistence of behavior change across nontreatment settings are presented in Chapter 5.

Increasing Behavior: Reinforcement

Positive reinforcement is a major component of treatment programs; you will want to include it in virtually all the interventions you design. Although the definition is fairly straightforward (presentation of an event following the occurrence of a behavior that increases or maintains the behavior), there are a number of details about reinforcement procedures that are sometimes overlooked. Negative reinforcement, which is the removal of an aversive stimulus following the occurrence of a behavior that increases or maintains the

behavior, is used far less often and will not be reviewed here. The reader is referred to Sulzer-Azaroff and Mayer (1977) for more information.

When a behavior is already in a student's repertoire (i.e., the student already knows how to perform the behavior), we can increase it by presenting a reinforcing event contingent on the occurrence of the behavior. It is important to remember that reinforcers are defined by the effect they have on a person's behavior. Therefore, we do not know on an a priori basis what will be reinforcing for a person. Before we can determine what serves as an effective reinforcer for someone, we must demonstrate it empirically by trying it out on each person. Only if the event increases or maintains that person's behavior can we say that it is a reinforcer.

As noted by Foxx (1982b), finding effective reinforcers for SPH students sometimes can be very difficult. They often have few reinforcers because their low functioning level may have precluded their engaging in a variety of potentially reinforcing activities. In addition, they may have had no exposure to a number of potential reinforcers.

To determine what is an effective reinforcer for a particular student, Smith and Snell (1978b) suggest four techniques. First, we can ask the student directly about his likes and dislikes. Since many SPH students have no oral expressive skills, we can first teach them to communicate by using a manual signing system (see Snell, 1974), by gesturing "yes" or "no," or by pointing to or even just by looking at pictures of potential reinforcers.

A second way to find out what may be reinforcing for a particular

student is to ask those who are familiar with the student's likes and dislikes for a list of potential reinforcers. This information can be gained by interviewing parents and teachers; school records also might yield this information. When using this method, it is especially important to verify what they say by using one of the other three techniques. It is possible that information gained from others might be inaccurate, and therefore useless, since what is reinforcing in one setting could be impractical, ineffective, or unavailable for use in another setting.

A third technique, which probably yields the most accurate list of reinforcers, is to observe the student over a period of several days in natural settings (e.g., in school classrooms, at the job site, or at home). Some reinforcers may become apparent by doing narrative recordings. For even greater precision, we can use systematic observational procedures such as duration of time spent in various activities or frequency of selecting certain toys.

The fourth technique is to structure the student's environment so that a period of reinforcement can be observed. This procedure is known as reinforcer sampling and allows the student free exposure to novel activities so that she may experience positive aspects of them. Reinforcer sampling is useful in teaching the reinforcing value of various events and, therefore, is particularly beneficial with SPH students. To begin with, allow the student briefly to sample a small number of items or events. For example, actually let her listen to some music, eat some ice cream, or play with various toys. Next, present this group of items to the student and record the frequency and duration of her choices. It is important to remember that if you are

presenting edibles, conduct the reinforcer sampling prior to a meal.

Foxx (1982b) suggests a fifth technique that can be helpful in discovering what is reinforcing for a student: observe similar types of students. This method is particularly helpful when working with a student who has so few behaviors in her repertoire that it is difficult to determine what is reinforcing to her. After observing these other similar students, make a list of what is reinforcing to them. Then, try these out on the student to determine which are reinforcers for her.

Types of Reinforcers

Sulzer-Azaroff and Mayer (1977) outline five types of reinforcers that can be used. Edibles are food items such as raisins. Before using them, be sure to find out if the student is allergic to anything. One problem you want to be sure to avoid with any reinforcer, especially with edibles, is satiation which may lead to a reduction in the student's performance or the effectiveness of the reinforcer when too much food has been consumed. To reduce the chance that satiation will occur, only use small pieces of food or portions of drink. You may be surprised at how small these can be and still be effective. To increase the compliance of a 3-1/2-year-old severely retarded boy, I used M & Ms that had been quartered. In addition, be sure to pair social reinforcement (e.g., smiles and praise) each time you present an edible reinforcer. For interventions that are carried out throughout the day, school personnel can wear an apron (some staff may prefer a carpenter's apron) or smock that has multiple pockets filled with squirt bottles of liquid reinforcers and solid edible reinforcers. There should be a variety of each. Wearing such a garment will ensure

that reinforcers can be delivered immediately (Foxx, 1982b).

A second type of reinforcement is tangibles which are small inexpensive objects. By being small, they can be delivered immediately contingent on the occurrence of the target behavior.

A third type is exchangeable reinforcers or tokens. They could be marks on a card or chips that are delivered immediately after the target behavior has occurred and which also signal that more powerful tangible or activity reinforcers will follow. I used tokens, which were hash marks on a card on his lap board, to increase the work productivity of a nonambulatory severely retarded adult. He exchanged these for tape which for him was a tangible reinforcer.

For SPH students who cannot count or grasp the concept of purchasing a back-up reinforcer, Kent (1974) suggests using a modified token economy in which tokens have varying value systems and can be exchanged whenever a teacher thinks a more tangible reinforcer is necessary in order to maintain the effectiveness of tokens as generalized reinforcers. The first step is to token train the student in order to establish an association between the token and its back-up reinforcer. There are eight steps that comprise the token training.

1. Select a behavior that the student can perform easily such as imitating a movement or following a simple command.

2. Ahead of time, place the following at a training table: several back-up reinforcers (which were previously demonstrated to be reinforcers to the student), a token container such as a can, and a uniform set of tokens (e.g., all checkers or all washers). The reinforcers should be arranged in a cupcake pan or on a small tray. Give particular attention to the type of token you select for students

who place objects in their mouths.

3. Tell the student to perform the behavior using gestural or physical prompts if necessary. Immediately after she does, place one token in her hand and praise her.

4. Next, the trainer should hold out a hand to collect the token, prompting the student if necessary, then immediately present the reinforcer tray and prompt her to select a reinforcer.

5. Repeat steps 3 and 4 (request, token and praise, immediate exchange for reinforcer) without prompting the student until she begins to associate tokens with the back-up reinforcers. This association is suggested when she reaches for the tokens after the response in an attempt to speed up the exchange process. Then, gradually increase the exchange schedule until four or five must be accumulated before they can be exchanged.

6. Introduce the token container to facilitate the collection and exchange process. The trainer drops the tokens into the can and shows the student how to empty the contents during exchange time.

7. Continue to increase the exchange ratio gradually. This process may take one or several sessions that generally should not last more than 15 minutes each.

8. Tokens may now be used during actual treatment sessions with the student. At the beginning of a session or periodically throughout the day, you may need to remind the student of the tokens' exchange value by allowing for low-ratio exchanges (e.g., only one or two tokens in order to gain access to the back-up reinforcers).

Although this type of token economy has been effective with many SPH students, it is not a simple procedure to implement. You may want

to use contingent praise and edibles, tangibles, or activities first before using tokens.

A fourth type of reinforcement is activity reinforcers such as watching television. By formally observing the student and recording how often (frequency) and how long (duration) she engages in various activities on her own, we often can identify high-probability behaviors which, in turn, can be used to reinforce low-probability behaviors. This phenomenon is known as the Premack principle. For it to be effective, we need to verify objectively that a certain behavior is indeed high frequency for a particular student and to avoid making subjective judgments about what she seems to enjoy doing or what people think most children like to do. For example, if Charlotte spends much of her time playing with musical toys, we can make access to these toys contingent on her putting on her shoes, a low-frequency behavior. Only when she put on her shoes by herself could she then play with these toys. When we use activity reinforcers, we need to limit the amount of time in which the student can engage in the activity in order to prevent satiation. For example, to increase task completion in a 12-year-old severely retarded boy, I provided him with 10 seconds of music contingent on filling one bottle.

Using high-probability behaviors as reinforcers has an advantage over tangibles in that they tend to be readily available; they are generally free of cost and naturally occurring as opposed to artificially applied. A difficulty in their use is that they are not easily turned on and off. This feature may lead to a delay in the delivery of reinforcement, which in turn, may mean that nontargeted intervening behaviors may be accidentally reinforced instead. To

counteract this potentially serious problem, we can reinforce the target behavior immediately with tokens or activity pictures that can be exchanged at a more convenient time. Using a kitchen timer may facilitate a student's understanding and cooperation because they structure the beginning and end of the activity. One final note is important to mention when using high-probability behaviors as reinforcers. It is unethical to identify a student's essential activities, such as eating or basic possessions, as reinforcers. However, we can use optional events that may serve as high-probability behaviors, e.g., a special snack (Smith & Snell, 1978b).

A fifth type is social reinforcement, such as attention, smiles, hugs, and praise, is the most natural of all the types of reinforcement. Since socials may not have reinforcing value to an SPH student, we can pair (i.e., present them along with) them with other types of reinforcement whenever they are used. Such pairing will enable an initially neutral social stimulus to assume reinforcing properties so that a target behavior can be maintained by socials alone even when a more artificial reinforcer has been faded. When social reinforcement is used, it is apparently most effective when we use specific or labeled praise (Bernhardt & Forehand, 1975). For example, when Charlotte puts on her shoes by herself, we should say, "Good, you put on your shoes!" and not, "Good girl!" Being specific will help Charlotte to learn that it was putting on her shoes, and not some other behavior such as sitting on the floor that evoked the praise.

Foxx (1982b) suggests using a sixth type of reinforcement, sensory reinforcers, which are sensations that the student likes or enjoys. There are five kinds of sensory reinforcers. One, a tactile

reinforcer, is skin-to-skin contact between the person doing the intervention and the student for which the student will respond. It can be a hug, a touch, or a rub on the back. This type is frequently used along with social reinforcers as when a teacher praises Charlotte for putting on her own shoes while hugging her and rubbing her back for a few seconds.

Two, vibratory stimulation can be especially powerful for multiply handicapped students. To deliver it, apply a vibrator to the student's neck, arms, hands, or legs for anywhere between 5 and 30 seconds (see Bailey & Meyerson, 1969). It should be battery operated and can be carried in one of the apron or smock pockets along with edible and liquid reinforcers. Note, for some multiply handicapped students, such as those with cerebral palsy, do not use a vibrator without the involvement of a physical therapist. Doughty (1976) provides information about how to construct an inexpensive automated device for delivering vibratory stimulation.

Other sensory reinforcers are olfactory reinforcers. These are substances that smell nice such as odors in a scratch-and-sniff book. Visual reinforcers are pleasant things to look at like a spinning color wheel, a strobe light, or a moving toy (see Rynders & Friedlander, 1972). Auditory reinforcers are pleasant sounds such as music.

Of all these kinds of reinforcers, which do we use? It will depend on what we have found to be reinforcing for a particular student as well as on the feasibility of using each. There might also be special cases in which one type is less appropriate, such as using edibles with a Prader-Willi case. We also need to consider each student's chronological age. Although we might allow a 5 year old to

hug us for social reinforcement, it would be less desirable to let a 17-year-old SPH student hug us since normal 17 year olds do not typically do that. To begin with, start with a reinforcer that is most natural to a situation (i.e., start with socials alone) and then move gradually to more artificial ones only if necessary. When artificial reinforcers are used to increase a target behavior, always pair them with socials and fade them as much as possible so that the behavior can be maintained by natural reinforcers (Sulzer-Azaroff & Mayer, 1977).

Maximizing the Effectiveness of a Reinforcer

Regardless of the type of reinforcement you use, there are several principles outlined by Sulzer-Azaroff and Mayer (1977) that should be considered. First, it is imperative that the initial response requirement be fairly easy for the student to achieve so that we can be sure that she gets reinforced. If we define our target behavior to be too complex or to involve too many steps, whatever the student does will fall below the record floor and she will never receive a reinforcer.

Second, in the early stages of intervention, the immediacy of reinforcement is especially important. This immediacy promotes the association of reinforcment with the performance of the target behavior and decreases the chance that intervening behaviors, some of which may be inappropriate, will be reinforced accidentally (Smith & Snell, 1978b). There are times when a delay of even a few seconds can be disastrous. For example, consider a situation in which we are trying to increase the eye contact of a profoundly retarded 2 year old named Andrew. The teacher tells him to look at her. As soon as he does, she should have a hand free to present the reinforcer (I used objects that

made a sound like bells or keys for this case). Let us suppose instead that when Andrew looked at the teacher, she first recorded the data and then fiddled with a spoon to get some applesauce. By the time she actually gives him the reinforcer, Andrew is looking away again. What has happened, then, is that she has reinforced Andrew for looking away.

Third, we need to consider the quantity of reinforcement that is delivered. In the section on edibles, we noted that satiation can occur. A person can also become sated by conditioned reinforcers such as socials. How much reinforcement to deliver will vary depending upon the situation. As a general rule, try not to overdo the amount, especially for artificial reinforcers, and treat each case empirically. If the amount you chose is not leading to an increase in the target behavior, you may want to increase the amount slightly, again evaluating its effect. For Andrew, rattling the keys or ringing the bell for a few seconds was sufficient.

Fourth, novelty of reinforcement is important, but is often overlooked. Students can get tired of the same thing over and over, so vary the reinforcers within each treatment session. You may even mix types of reinforcers. For example, I once worked with an 18-year-old severely retarded young man, Matthew, who was an elective mute. He had many words in his behavioral repertoire, he just would not use them. During treatment sessions with him, I used edible (e.g., raisins, potato chips divided into smaller pieces, milk, juice, portions of graham crackers, applesauce) and activity reinforcers (e.g., 5 seconds to play musical typewriter or to wind up a small toy). These were always paired with socials. I conducted Matthew's sessions just before lunch and late in the afternoon so that the edibles would be powerful

reinforcers.

And fifth, even when we have found a number of reinforcers for a student, we must keep in mind that there may be competing contingencies operating at the same time on him. Ordinarily, social reinforcement may be quite adequate to maintain a student's sweeping the floor, but not when the television is on. Although adding a more artificial reinforcer may be effective, in this case, simply turning off the TV (preferably beforehand) may be all that needs to be done. For situations in which a student engages in behaviors that are very reinforcing, such as self-stimulation, we must try to substitute an even stronger contingency. For example, we might provide the student with access to other stimulating activities (e.g., music, lights, or interesting toys). In addition, if he has to use two hands to press down a lever to hear the music, this behavior is incompatible with the hand flapping which, in turn, will lead to a reduction in his self-stim.

Schedules of Reinforcement

We can provide reinforcement contingent on the performance of the target behavior every time it occurs, a continuous (CRF) schedule, or only some of the time, an intermittent schedule. In the beginning stages of an intervention, we should use a continuous schedule. Once the behavior has reached criterion, it is essential to thin the reinforcement scheduled so that a reinforcer is not presented every time the target behavior occurs. This process should be done gradually so that the behavior does not deteriorate. To begin with, provide a reinforcer on the average of every other occurrence of the behavior (a variable ratio or VR2 schedule),[8] then gradually require greater

numbers of responses to occur before providing a reinforcer. Reinforcement also can be provided the first time the target behavior occurs after varying intervals of time, as when we reinforce a student for drying dishes on the average of every 3 minutes (a variable interval or VI3 schedule). Using an intermittent schedule will make the target behavior more resistant to extinction.

Summary of Reinforcement

Positive reinforcement is an extremely important component of all interventions and can be a powerful technique when consideration is given to factors to maximize its effectiveness. Reinforcers are defined by the effect they have on a person's behavior. Since there is no universal reinforcer that is equally effective for everyone, our first task is to determine what is reinforcing for a particular student. There are at least five ways to try to identify a student's potential reinforcers: (a) ask the student; (b) ask those who work with the student; (c) observe the student in natural settings; (d) have the student try a variety of potential reinforcers; and (e) observe similar students.

There are a number of different kinds of reinforcement. These include edibles, tangibles, tokens, activity reinforcers, and sensory reinforcers. Social reinforcement is the most important since it occurs in the natural environment. Since praise alone may not be reinforcing for a student, socials always should be paired with strong

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[8] If we have targeted appropriate use of a napkin at mealtime, we can reinforce Emma after the first time she wipes her mouth, then after the fourth time, and then after the sixth time. We are reinforcing her on an average of every two responses (after one response, then after another three, then after another two: $(1 + 3 + 2) \div 3 = 2$).

reinforcers so that they can become reinforcing.

Since reinforcement, no matter how powerful it is, will have no effect if it is never delivered, we should make the initial response requirement relatively easy for the student to achieve. It is essential that the reinforcer is presented contingent on the occurrence of the target behavior; provide the reinforcer immediately after the response, not before it occurs. Since satiation may occur if too much of one reinforcer is presented, which results in a decrease in the student's behavior, keep the amount presented to the minimum level that is effective. It is also important to vary the reinforcers within every session.

After finding effective reinforcers for a student, be sure to take into consideration that there may be competing contingencies acting on the student at the same time. In these situations, you may need to remove the competing contingency or substitute a more powerful reinforcer than the one you are using.

Once the target behavior has reached criterion, switch from a continuous to an intermittent schedule of reinforcement to make the behavior change more resistant to extinction. Before terminating any treatment procedure, you should not be reinforcing every occurrence of the target behavior.

Teaching New Behavior

Much of our instruction with SPH students involves developing functional behaviors that will help them to be as independent as possible. Use of contingent reinforcement alone will not get us very far when behaviors never occur. We cannot just wait until a student combs his hair and then reinforce it; he may not know how to comb his

hair so never does. Clearly, what we must do first is teach the student how to comb his hair.

Shaping

Shaping is a procedure used to form a behavior that is not already part of a student's repertoire. We begin by reinforcing the student's initial behavior, a response that the student can make that is also similar to the target behavior, and then reinforcing small changes, known as successive approximations, in the student's behavior as it gradually approaches the desired behavior (Foxx, 1982b; Sulzer-Azaroff & Mayer, 1977). For example, we could reinforce William for holding a comb (the initial behavior), then for holding a comb up to his hair, for running it through his hair very briefly, for combing his hair with one stroke (the successive approximations), and finally for combing his hair with five strokes (the terminal behavior). After increasing the student's initial behavior by reinforcing it, we no longer reinforce it until it is more similar to the target behavior. We are requiring him to change his behavior in the direction of the target behavior before we provide a reinforcer.

When using a shaping procedure, Foxx (1982b) recommends following seven steps. You will not get through all of these in one treatment session.

1. Select the target behavior. It is essential to specify the dimensions (defined in the section on writing behavioral objectives in Chapter 1) of the terminal behavior so that you can identify when the student has performed it and so that you can reduce the possibility of strengthening other irrelevant behaviors by reinforcing them. It is also important to have a clear specification of the criteria for

judging when the student has reached an acceptable level of the target behavior. If you have written an appropriate behavioral objective, both the behavioral dimensions and criteria will already be clearly defined.

2. Select the initial behavior that the student can presently do that is similar to the target behavior in some way. To find the starting point, observe the student for a few days in the natural or training setting. For behaviors that can be arranged in a graduated sequence of steps, Sulzer-Azaroff and Mayer (1977) indicate that the best way to determine the starting point is to have the student go through the steps until she reaches a point at which she performs poorly. At this point, we should move back to the highest level the student completed successfully and use it as the initial behavior.

3. Select a variety of reinforcers for reinforcing the initial behavior, the successive approximations of the target behavior, and the target behavior. Since we are requiring the student to change her behavior continuously as she progresses toward the target behavior, the use of powerful reinforcers will ensure that she is motivated to keep trying various approximations until she performs one that is reinforced.

4. Reinforce the initial behavior until it occurs frequently. This step will increase the chance that a slight variation of it will occur that more closely approximates the target behavior.

5. Reinforce successive approximations of the target behavior each time they occur. Knowing how long to reinforce one level of performance before requiring the next level and how large to make each step is tricky. If we reinforce one step too long, that behavioral

approximation may become rigidly established so that it is difficult to motivate the student to progress to the next approximation. Therefore, it may be necessary to make the next step very easy and to give several trials of similar small steps. If we make a step too large, the student's new level of performance may begin to disintegrate. If this problem occurs, you probably will need to back track a bit so that the step is smaller, i.e., the new approximation is only slightly better than the previous one. For situations in which the break up of the behavior is severe, you generally will need to revert to a much lower level of performance, reinforce the student for performing at that level, and then progress to higher levels very slowly. As a general guideline to enable the student to succeed much more often than she fails, reinforce three to five occurrences of her behavior at a given level before moving to the next approximation..

6. Reinforce the target behavior each time it occurs. As noted by Sulzer-Azaroff and Mayer (1977), reaching the terminal goal alone is not sufficient. Once the student's new behavior has been shaped, it is still at low strength. To strengthen it so that the behavior does not revert back to a lower level, use a continuous (CRF) schedule of reinforcement to establish the target behavior firmly in the student's repertoire.

7. Reinforce the target behavior on an intermittent schedule of reinforcement. The student's performance of the newly acquired behavior will decrease if we continue to use a CRF schedule too long. Therefore, it is imperative that you thin the reinforcement schedule so that the behavior is reinforced on a variable schedule.

A final component is necessary for any type of intervention,

namely, planning for generalization so that the target behavior will occur in non-treatment settings. Techniques for programming for generalization and maintenance are discussed in Chapter 5.

Practice Exercise 4: Application of a Shaping Procedure

Ross is being trained to help with cleaning up the kitchen after lunch. His job will be to sweep the kitchen floor. Since he exhibits an initial behavior that resembles sweeping, a shaping procedure is an appopriate teaching strategy. To practice designing a shaping program, go through the seven steps in the shaping process to teach Ross how to sweep the floor. You may want to review the sections on behavioral objectives, types of reinforcement, and schedules of reinforcement before starting this exercise. One set of answers can be found in Appendix K.

Rather than merely waiting for the student to emit an initial behavior or a certain approximation, there are several ways that we can help him to respond. We can occasion the level of behavior that we are working on by presenting a discriminative stimulus (S^D) such as instructions or prompts. An S^D increases the likelihood that a behavior will occur because in the past, responses emitted in the presence of that stimulus have been reinforced (Sulzer-Azaroff & Mayer, 1977). For example, we could use a verbal (or instructional) prompt, "Ross, sweep harder" to facilitate his performing the first approximation.

A second type of S^D we could present is a gestural prompt which might include pointing or looking in a certain direction. If Ross did not respond to the verbal prompt, the aide might point to the broom and

then to the floor.

A third way to facilitate the shaping process is to use an imitative prompt. Here the change agent would demonstrate the level of the behavior. For instance, the teacher's aide could hold the broom herself and model how to sweep harder.

A fourth way is to use a physical prompt. Physical guidance, in which the student is manually guided through the appropriate response, can be used if instructional, gestural, or imitative prompts do not occasion the desired behavior. If Ross does not imitate the aide, she can put her hands on his and put him through the motions of sweeping.

When we use prompts with SPH students, we often combine verbal and imitative prompts to occasion the desired behavior. If these are not effective, then we may try a gestural prompt and finally a physical prompt. Regardless of the kind of prompt we use, we must be sure to observe the student closely to ensure that he performs the response we want. Continue to prompt until you do get the desired response. When you do, remember to reinforce his behavior. Have him repeat the behavior several times without being prompted before moving on to the next step in the shaping procedure.

Since shaping a target behavior can be accomplished much more rapidly when we use S^Ds to occasion each approximation, we frequently find ourselves providing a lot of prompts. We need to be careful, though, that we do not let the student become too dependent on prompts. Therefore, we generally want to fade (i.e., gradually remove) prompts at one level of the behavior before moving on to the next step in the shaping process. As noted by Foxx (1982b), not all of the S^Ds are faded, only those prompts presented by the change agent. Consider Ross

who does not sweep the floor forcefully enough to do much good. The aide's task, once she has occasioned sweeping at the appropriate intensity, is to fade all the verbal, imitative, gestural, and physical prompts she used so that naturally occurring stimuli associated with sweeping will cue him to do so. We want Ross to be cued to sweep by its being the end of lunch or by his seeing a dirty floor.

Fading generally can be accomplished with minimal disruption by removing prompts gradually and by moving toward more natural prompts. An important guideline to follow is to prompt as little as possible to occasion a response. Therefore, we begin with the least intrusive prompts that we can, such as a verbal prompt, and proceed to those that are more intrusive, such as a physical prompt, only if necessary. We also need to avoid sharp reductions in the prompting. If the student starts to make a lot of errors, we probably have faded the prompts too abruptly (Sulzer-Azaroff & Mayer, 1977).

We begin by fading the prompt that is controlling the desired response. For example, if Ross sweeps only if we manually guide him, then we start the process by fading the physical prompt. Gradual fading is important since the shift from physical guidance to none whatsoever is likely to be too abrupt. Foxx (1982b) outlines four ways to fade a physical prompt. First, progressively reduce the amount of touch (e.g., use your hand, then just your fingers, and finally, just touch the student with one finger). Second, progressively reduce the amount of pressure associated with the touch so that less pressure is used with each of the succeeding prompts. Third, move the location of where you touch the student away from the focal point of the behavior, e.g., move your touch further up the student's arm away from his hands

when you are prompting sweeping. Finally, we can use different kinds of prompts in the beginning of training and fade the physical prompts first while continuing the imitative, gestural, or verbal prompts. For example, consider Megan who successfully hangs up her blouse only when she is manually guided to do it. Since our goal is for Megan to be able to care for herself as independently as possible, she should hang up her blouse with little or no prompting. We need to pair instructions with physical guidance. We then fade out the physical guidance and substitute gestural or imitative prompts while continuing the instructional prompts. Then the gestures and demonstrations are faded until only instructions are used. These, in turn, are faded until only the critical S^D, her blouse on the chair, comes to occasion hanging-up behavior.

Imitative prompts consist first of the fully modeled target behavior. To fade them, little by little we make the demonstrations less complete by fading into more and more subtle gestures (Sulzer-Azaroff & Mayer, 1977). To fade gestural prompts, reduce the size of the gesture, e.g., from holding out the arm and pointing to pointing without extending the arm. We can also use a less obvious gesture such as glancing instead of pointing. Eventually, we even want to fade verbal prompts. One way is to reduce the number of words in the instruction. For example, we might say, "Megan, hang up your blouse," then "hang up blouse." Second, we can speak more softly so that she will have to pay more attention to what you are saying (Foxx, 1982b).

Summary of Shaping

One method of teaching a student a behavior that is not in his repertoire is to use a shaping procedure in which his initial behavior

is reinforced and then successive approximations are until the terminal behavior is reached. Once the target behavior has been reached, we should use a continuous reinforcement schedule to strengthen it. Next we must be sure to thin the reinforcement schedule so that the behavior will persist over time. To facilitate the shaping process, we can occasion each level of the behavior by presenting discriminative stimuli such as verbal, gestural, imitative, or physical prompts. Since we want the student to respond appropriately on his own, we need to fade these prompts until naturally occuring S^Ds alone occasion the behavior. Once a prompt has been faded and a student has started to respond to a less intrusive prompt, do not start using the earlier more obvious prompt. To give the student extra practice at performing the behavior correctly, begin each new session with the same prompts that he correctly responded to at the end of the previous session.

Chaining

To maximize the effectiveness of our training programs for SPH students, we can use a task analysis model which allows us to teach a complex behavior by chaining together simple behaviors. A task analysis has three main components: (a) a specification of the behavioral objective, (b) a detailed description of the sequence or chain of subskills that make up the target behavior, and (c) an assessment of the student's baseline skill level (Foxx, 1982b). We reviewed behavioral objectives in Chapter 1. The second part of the model entails writing down the steps that a person must go through to perform the behavior. We can determine the sequence of steps necessary to perform a task by relying on memory or by actually performing the behavior and then listing each component immediately afterwards. The

subskills in the behavioral sequence are called links. In most task analyses, the sequence of behaviors must follow a certain order although occasionally, some of the links could be performed in a slightly different order. Figure 5 diagrams a task analysis of the chain "changing a stained pad," which was one of three task analyses used by Richman, Ponticas, Page, and Epps (1983) to teach menstrual-hygiene skills to moderately and severely retarded young women. It also serves as a data sheet for recording which of the links the student correctly performed. Figure 6 is a type of graph that can be used for recording the frequency of correctly chained responses in forward and backward chaining (see Smith & Snell, 1978b). The columns are reversed when backward chaining is used so that the backward teaching order is closest to the graph.

Chaining together a series of functionally related responses may proceed in a forward or backward direction. In forward chaining, which is used when the student can already perform all (or at least most) of the steps in the task analysis, the responses are chained together beginning with the first link and ending with the last. If one of the links in the sequence is not in the student's repertoire, we can use a shaping procedure to teach it; then the entire sequence of subskills can be chained together. In the menstrual-hygiene example, a student, Catherine, is reinforced first for identifying a stained pad. Then identifying a stained pad and obtaining a clean pad are chained together; she must perform both of these in sequence before being reinforced. The forward chaining procedure continues until Catherine performs all of the responses in order; she is not reinforced at this stage until she properly disposes of the paper bag. At this point, the

Changing A Stained Pad

1.	Identify stained pad	___	___	___
2.	Obtain clean pad	___	___	___
3.	Obtain paper bag	___	___	___
4.	Return to bathroom and close door	___	___	___
5.	Wash hands	___	___	___
6.	Pull underwear below knees and sit on toilet	___	___	___
7.	Remove soiled pad from underwear	___	___	___
8.	Place soiled pad in paper bag	___	___	___
9.	Wipe vaginal area	___	___	___
10.	Dispose of paper in toilet	___	___	___
11.	Flush toilet once	___	___	___
12.	Pull tab off clean pad	___	___	___
13.	Properly dispose of tab	___	___	___
14.	Press clean pad into underwear	___	___	___
15.	Pull up underwear and outer clothes	___	___	___
16.	Wash hands	___	___	___
17.	Properly dispose of paper bag	___	___	___

Figure 5. Task analysis of the chain "changing a stained pad" (Richman, Ponticas, Page, & Epps, 1983).

Backward Sequential Order in Performance	Forward Teaching Order
17.	1. Identify stained pad
16.	2. Obtain clean pad
15.	3. Obtain paper bag
14.	4. Return to bathroom and close door
13.	5. Wash hands
12.	6. Pull underwear below knees and sit on toilet
11.	7. Remove soiled pad from underwear
10.	8. Place soiled pad in paper bag
9.	9. Wipe vaginal area
8.	10. Dispose of paper in toilet
7.	11. Flush toilet once
6.	12. Pull tab off clean pad
5.	13. Properly dispose of tab
4.	14. Press clean pad into underwear
3.	15. Pull up underwear and outer clothes
2.	16. Wash hands
1.	17. Properly dispose of paper bag

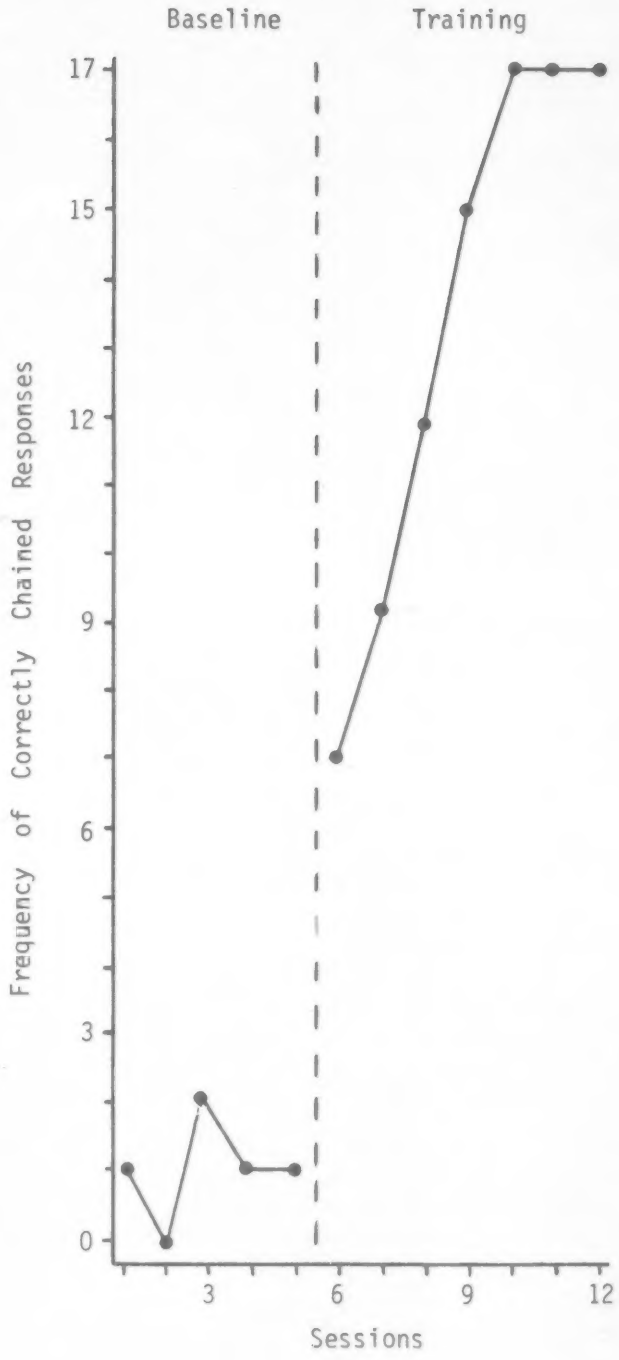

Figure 6. Performance in menstrual-hygiene skills taught by foward chaining.

behavioral objective has been met and the behavior chain completed. Foxx (1982b) suggests that forward chaining is most appropriate for high functioning retarded students.

Backward chaining is the procedure we use to teach a behavior chain to a student who cannot perform many if any of the steps. Here we teach the last links in the behavior chain first and teach the first link last of all. It is generally more appropriate for severely and profoundly retarded students than forward chaining because it does not require that the student have the necessary behaviors in his repertoire. The last link in the chain is closest to the terminal reinforcer; therefore, it is the strongest response because it is always associated with the immediate delivery of the terminal reinforcer (Foxx, 1982b). It thus makes sense to start the chaining process with the strongest response.

If we used backward chaining to train menstrual-hygiene skills, we would have Catherine first dispose of the paper bag and then reinforce her. Working in a backward order, we then would have Catherine wash the doll's hands[9] and dispose of the paper bag before reinforcing her. Next we would have her pull up the doll's underwear and outer clothes, wash the doll's hands, and dispose of the paper bag before reinforcing her. This process continues until Catherine performed the entire behavioral sequence.

Whenever you use chaining, present supplementary S^Ds (e.g., prompts) to occasion links in the chain or to occasion approximations

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[9]Actual training was done using dolls in the Richman et al. (1983) study. Probes then were taken on the performance of the subjects as they cared for their own menstrual-hygiene needs under both simulated and in-vivo conditions.

of these links when shaping is necessary. Before adding on another link, fade out your prompting and reinforce the student for correctly performing each sequence of subskills. It is also very important to reinforce the full chain as quickly and as often as possible to strengthen it. Once the behavioral chain has become well established, be sure to thin the reinforcement schedule.

After we have specified the behavioral objective and conducted a task analysis, we are ready to analyze the student's baseline or entry behaviors (Foxx, 1982b). These are the behaviors she can do before we actually start the training program. The entry level will determine where in the behavioral chain we begin our instruction. For example, we might end up starting at the fifth step in a chain. To determine the student's entry behaviors, we can review written records of her behavior or interview people who are familiar with her skills. However, clearly the best way to determine the student's present level of skills is by observing her directly; present her with the task and see which of the steps she performs. If Catherine completes steps 1 through 4, then training should begin by chaining step 5 to the previous sequence.

Summary of Chaining

Chaining is a procedure for teaching complex behaviors by chaining together simple behaviors. We can determine the sequence of the steps that are necessary to perform the target behavior by relying on our memory or by actually doing the task and then writing down each step. We use forward chaining when the student already knows how to perform each of the steps; the responses are chained together by beginning with the first link in the sequence and ending with the last. Backward

chaining is used when the student does not know how to perform the individual steps; here the responses are chained together by first teaching the last link in the behavior chain and working in a backward sequential order. Shaping can be combined with chaining to teach any links that are not in the student's repertoire. Supplementary S^Ds also may be used to occasion links or approximations of these links; these prompts should be faded before chaining another link. Reinforcement of correct responses should be used throughout the chaining process including once the student performs the entire chain. Reinforcement is then thinned so that we can maintain the behavior. After conducting a task analysis and determining the sequence of steps that are necessary to perform the target behavior, we need to determine the student's baseline behaviors. If he can already perform some of the steps, we may not need to start with the first link (for forward chaining) or the last link (with backward chaining).

Decreasing Behavior

Least Restrictive Treatment Model

When designing interventions to decrease the inappropriate behavior of SPH students, the least restrictive treatment model must be followed. Procedures for decreasing maladaptive behavior can be ranked according to their aversiveness, intrusiveness, and severity. Foxx (1982a) divides these procedures into three levels.

Level 1	Level 2	Level 3
DRO (differential reinforcement of other behavior)	Negative practice (when manual guidance is not used)	Negative practice (when manual guidance is used)

Level 1	Level 2	Level 3
DRA (differential reinforcement of appropriate behavior)	Extinction	Exclusionary timeout
DRI (differential reinforcement of incompatible behavior)	Response cost	Overcorrection
DRL (differential reinforcement of low rates)	Nonexclusionary timeout	Physical restraint
Satiation		

Since level 1 procedures are not aversive, you do not need permission to use them except for when satiation is used to treat rumination. Parental and administrative permission should be obtained before using level 2 procedures since they do have some aversive properties or may produce side effects. Considerable care must be exercised before using level 3 procedures because they can be very intrusive. To implement them, written permission must be obtained from your facility's human rights committee as well as from legal guardians and administrators.

We cannot use a more aversive procedure unless we have done one of two things: (a) demonstrated that a less aversive procedure did not effect a behavior change or (b) conducted a review of the treatment literature and found that it indicates that less intrusive techniques

have been ineffective for the particular behavior you have targeted.

When implementing an intervention to decrease inappropriate behavior, follow these steps of the least restrictive model outlined by Foxx (1982a).

1. Take baseline data on the target behavior. Such pretreatment data will provide an estimate of the level of the behavior which will help you in prioritizing your goals. For example, you may take baseline data on self-injurious behavior (sib), aggression, and noncompliance and find that aggression occurs at the highest rate. Especially if you need to train school personnel in how to implement treatment procedures, you probably will want to focus on aggression at first. Baseline data are also important to take so that you can determine the degree to which the intervention reduced the behavior.

2. Review the treatment literature to determine which procedures have documented effectiveness in decreasing or eliminating the inappropriate behavior. Because there are so many studies that have been done, you will probably want to keep some sort of reference file. Some of the numerous journals that publish articles on intervention with the mentally retarded include:

American Journal of Mental Deficiency

Analysis and Intervention in Developmental Disabilities

Applied Research in Mental Retardation

Behavior Modification

Behavior Research of Severe Developmental Disabilities

Behavior Therapy

Behaviour Research and Therapy

Child Behavior Therapy

Education and Training of the Mentally Retarded

Education and Treatment of Children

Journal of Applied Behavior Analysis

The Journal of the Association for the Severely Handicapped

Mental Retardation

Various professional associations have abstract services that are available to save you time in searching the literature.[10]

3. From the procedures of demonstrated effectiveness, select the least restrictive behavioral treatment that is most appropriate for the target student. Your choice will depend on the severity of the problem and on the developmental level of the student.

4. During treatment, continue to take data with periodic reliability checks. Compare these data to baseline data to determine the effectiveness of each phase of the intervention. There are at least four ways to evaluate the degree of behavior change effected by an intervention. First, is there a change in trend? Is the behavior changing at a greater rate? To determine the trend, you can use the split-middle technique (see White & Haring, 1980, or White & Liberty, 1976). Second, what is the latency? How long does it take before the intervention starts to work; does it show an immediate or a delayed effect? Third, is there a change in level? Is there a difference in the level (e.g., frequency, rate, or percent interval) of the behavior

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[10] PsycSCAN: LD/MR is issued quarterly and includes abstracts of journal articles on the assessment, treatment, and education of the mentally retarded. It is available to members of the American Psychological Association for $10 and to nonmembers for $15. You can write or call for more information and a sample copy from: American Psychological Association; 1400 N. Uhle St.; Arlington, VA 22201; (800)336-4980.

between the last baseline session and the first treatment session? And fourth, is there a change in mean or median? Do we see a difference in the average of the data between baseline and treatment phases? We can use the mean as the average measure when there is not much variability in the data (e.g., the data within a phase range from a frequency of 30 to 38). When the data are highly variable or when there is an aberrant data point (e.g., frequencies of 27, 32, 4, 29, and 36), the median provides a more representative measure of central tendency. Examples of each of these can be found in Appendix L. For more information on evaluating behavior change via statistical analysis and visual inspection, see Kazdin (1982).

5. Only select a more restrictive treatment procedure if your data indicate that a less intrusive procedure was ineffective. You should have actual data (and not just verbal report) to demonstrate that the previous phase of the intervention did not decrease the behavior. If your first treatment phase is not having the desired effect, be sure to do a fine-tuned analysis (e.g., do we have effective and powerful reinforcers for this student; has staff consistently implemented treatment; is our measurement system valid; is there an ecological variable we have overlooked?). Unless the behavior poses an extreme risk to the student (e.g., severe sib) or to others (e.g., severe aggression), we generally should continue a procedure for at least a week.

6. When considering highly aversive procedures; be sure to obtain written permission from the student's parents, the human rights committee, and the facility administrator prior to implementing these procedures. The consent form should explain previously implemented

treatments that were ineffective and describe the treatment procedures and any possible side effects. It also should include a statement that the procedures will be carefully monitored and supervised and terminated whenever the legal guardians request it. See Cook, Altman, and Haavik (1978) for more detail on obtaining consent for aversive treatment.

When implementing any intervention, particularly one in which we use aversive techniques to decrease aberrant behavior, we need to document what we have done, what we are doing, and what we intend to do. In this way, we can make appropriate and timely treatment decisions, keep people informed, and avoid legal complications.

Level 1: Reducing Behavior via Positive Approaches

The least restrictive procedures for reducing inappropriate behavior use reinforcement. You may wish to review the section on reinforcement, pages 61-74, before continuing.

Differential Reinforcement of Other Behavior (DRO). DRO is a procedure in which we reinforce any behavior the student emits except for the target behavior. Because reinforcement is delivered contingent on the absence or omission rather than commission of a behavior, the DRO procedure also may be called omission training. Reinforcement is delivered according to a specified schedule except when the student engages in the target behavior. Thus, we look for the target response at a specific moment; if it is not occurring at that moment, the reinforcer is delivered. A common variation of this procedure, sometimes called a whole-interval DRO, is to arrange the contingency so that there must be an absence of the target behavior for the entire

103

interval before reinforcement is delivered[11] (Sulzer-Azaroff & Mayer, 1977).

Consider a situation in which Esther, a 7-year-old severely retarded girl engages in pica; she spends much of her time putting inedible objects in her mouth. Before we begin an intervention, we first need to take baseline data. We decide to train the teacher's aide to take data and then to implement treatment procedures. Since the aide has other students he works with, 5 minutes of event recording per half hour will be conducted throughout the day. After completing a 5-day baseline, we find that Esther places objects in her mouth on the average of about once a minute. Based on this information, there are five rules that we need to follow when designing an intervention program (Foxx, 1982a).

1. When using a DRO procedure, always select the initial DRO interval that is at least half the average interval in which the inappropriate behavior occurs. Following this guideline will ensure that we will have the opportunity to deliver the reinforcer. For Esther, we set the DRO interval at 30 seconds.

2. Select a block of time each day that can be devoted totally to the student's program. Limiting the program to a relatively short amount of time will substantially increase the chance that it will be implemented consistently. The aide will only use the DRO procedure with Esther during a half hour block a day.

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[11] Since reinforcement is contingent upon a zero rate of emitting the target behavior throughout the entire interval, this contingency combines a DRO with a DRL of zero. DRL is discussed in the following pages.

3. In most situations, it is best to have one person take responsibility for the intervention. This approach eliminates the possibility of inconsistencies across change agents. The aide initially will be the primary change agent for Esther. After we get the pica down to an acceptable level, we will introduce other therapists (e.g., the teacher) as we begin to plan for generalization.

4. When treatment is directed toward decreasing behavior, present activities that are as incompatible as possible with the inappropriate behavior. If Esther puts her fingers in her mouth, we can provide her with toys, preferably ones that require both hands. As she plays with them, she will not be able to put her fingers in her mouth. We also will want to use toys that are too large for her to place in her mouth.

5. When using any reinforcement procedure, be sure to present a variety of items or events that, in fact, are reinforcing for that particular student. Both immediacy (in the early stages of an intervention) and novelty of reinforcement are important. Some of Esther's preferred foods and drinks (e.g., orange juice, apple juice, raisins, pudding, and mini marshmallows) as well as visual reinforcers (e.g., a spinning color wheel) and auditory reinforcers (e.g., a music box) comprised our pool of reinforcers. In the first phase of our intervention, we presented one of these paired with socials contingent on the absence of pica at the end of the 30-second interval. We also could use a whole-interval DRO procedure. Since it is more difficult for the student to earn a reinforcer under this variation, we should shorten the interval (e.g., to 15 or 20 seconds).

DRO is a positive approach that reduces behavior fairly rapidly especially when a whole-interval DRO procedure is used. There is a

disadvantage to its use, however, because other behaviors may be reinforced. The problem here is that we may wind up reinforcing a behavior that was just as inappropriate or perhaps even worse than the target behavior. Let us suppose that Esther has gone 30 seconds without putting anything in her mouth. Just as the aide presents the music box, Esther slaps herself in the face. Hence, our DRO procedure might end up reinforcing self-injurious behavior. To overcome this problem, you can put several of the student's most undesirable behaviors on DRO at the same time. To ensure that there is a sufficient number of reinforceable intervals in such a situation, you may need to shorten the interval in which no aberrant behaviors can occur before reinforcement is delivered. For students who engage in many inappropriate behaviors, it is better to let a DRO interval pass without reinforcing the student than to reinforce an undesirable behavior. It also might become necessary to opt for another reductive procedure (Sulzer-Azaroff & Mayer, 1977).

Differential Reinforcement of Appropriate Behavior (DRA). DRA is a procedure in which reinforcement is delivered contingent on the occurrence of a prespecified appropriate behavior. When using DRA, select a behavior to increase that the student already performs. The rationale for using a DRA procedure to reduce behavior is that increasing an appropriate behavior may produce a decrease in aberrant behavior (Foxx, 1982a). When we are interested in decreasing inappropriate behaviors, we need to take baseline data on them while we provide an intervention and take treatment data on the appropriate behavior we have targeted. Examining the data is essential if we are going to be objective in our decision making. As an example of a DRA

procedure, consider the case of David, a 3-year-old severely retarded boy with whom I worked on an inpatient basis. The main focus of treatment was on increasing his compliance. As David's compliance was increased by using contingent reinforcement, his object throwing, which remained under baseline conditions, decreased. Russo, Cataldo, and Cushing (1981) also found behavioral covariation. They reinforced compliance and as it increased, untreated deviant behaviors (e.g., crying) decreased.

DRA is the procedure to use whenever you want to increase a behavior regardless of whether or not any inappropriate behaviors are occurring. Its use does entail certain disadvantages, however. DRA does not affect the undesirable behavior directly. We may see covariation between the appropriate behavior we are reinforcing and an inappropriate behavior, but we will not necessarily demonstrate an inverse relationship in which aberrant behavior decreases as the targeted appropriate behavior increases. Of course it is also possible that the misbehavior will not be affected much by a DRA procedure. In such a situation, which we determine by looking at our data, we may want to combine DRA with another procedure, such as overcorrection, for object throwing. (Here we are getting into more intensive treatment procedures.) Or we may decide to use a DRI procedure.

Differential Reinforcement of Incompatible Behavior (DRI). DRI is a procedure in which reinforcement is presented contingent on the performance of a prespecified appropriate behavior that is physically and functionally incompatible with the targeted aberrant behvior. DRI provides more reinforcement control over the undesirable behavior than does DRO or DRA because the appropriate and inappropriate behaviors

cannot occur at the same time because they are functionally incompatible. When using a DRI procedure, always select a behavior to reinforce that is already in the student's behavioral repertoire, is physically and functionally incompatible with the behavior you are trying to decrease, and is socially and educationally appropriate (Foxx, 1982a). A problem with DRI is that it can be difficult to find an appropriate incompatible behavior to reinforce. The following examples illustrate possible applications of a DRI procedure.

	Inappropriate Behavior	Incompatible Behavior(s) to Reinforce
1.	stuffing food in mouth	putting hands in lap after each bite
2.	urinating in pants	urinating in toilet and/or keeping pants dry
3.	flapping hands	packing car points in a box during vocational workshop; playing with toys requiring both hands during leisure time
4.	taking toys away	sharing toys

Differential Reinforcement of Low Rates (DRL). DRL is used when we want to reduce but not necessarily to eliminate a response. It involves providing reinforcement when responses occur below a predetermined rate (i.e., the rate during baseline). There are two ways that we can specify what the rate of the behavior must not exceed. The decision to reinforce or not to reinforce may be made on an average rate which is the average rate of responding over a specific interval of time. For operant-to-operant rates, we consider each interval between the initiation of one response and the next (White, 1971). Operant-to-operant rates are time consuming and more difficult to measure than averaged rates, but they do lead to a more rapid

reduction in the behavior because they selectively reinforce responses that are further apart in time. One of the advantages of a DRL procedure is that it is suitable for a progressive reduction in response rate by either keeping the response limit constant and increasing the time interval or by keeping the same unit of time and reducing the number of responses that are allowed. However, DRL is not as efficient as some other reductive procedures; it does take time to decrease a behavior. In addition, it focuses attention on the undesirable behavior which means that the occurrence of appropriate behaviors may be overlooked. To counteract this problem, we can combine DRL with DRA (Sulzer-Azaroff & Mayer, 1977).

Let's consider a situation in which we could consider using DRL. Joseph is a severely retarded adolescent who spends a lot of his time combing his hair. Since we only want to reduce and not eliminate his haircombing, DRL is an appropriate procedure. Baseline data indicate that he combs his hair on an average of seven occasions during a 15-minute interval with no more than 3 minutes between each occurrence. There are two approaches we can take in implementing a DRL procedure. First, we can start by presenting a reinforcer (we can use tokens since Joseph has been token trained) at the end of each 15-minute interval if he combs his hair on six or fewer occasions. A second way is to begin by presenting a reinforcer each time Joseph waits at least 3-1/2 minutes before starting to comb his hair again. Gradually, we can lower the response criterion (e.g., to one or fewer occurrences of hair combing per 15-minute interval) or lower it and increase the time interval (e.g., to one or fewer occurrences of hair combing per 30-minute interval). If using the second DRL procedure, we can increase

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the minimum interval between his beginning to comb his hair (e.g., to 30 minutes).

Satiation. Satiation is a procedure in which a reinforcer that has been maintaining an inappropriate behavior is presented in unlimited amounts noncontingently in order to reduce that behavior. The undesirable behavior is decreased because the student is not motivated to perform it because she is not deprived of it. Foxx (1982a) points out that there are two especially important points to remember when using satiation as a reduction procedure.

1. Before the student has had a chance to engage in the inappropriate behavior, provide large quantities of the reinforcer or long periods of access to it noncontingently You may end up reinforcing the misbehavior if you provide reinforcement after its occurrence.

2. Make sure that you, in fact, have identified the specific reinforcer that is maintaining this particular inappropriate behavior.

Keep in mind that the satiation procedure is only appropriate for a few types of inappropriate behavior. It has been used primarily for undesirable behaviors that are related to food or that are annoying but not much of a threat to the student or to others. For instance, satiation has been used to treat rumination (Jackson, Johnson, Ackron, & Crowley, 1975), food stealing, clothes tearing, and hoarding.

Foxx (1982a) describes the use of satiation in the treatment of rumination. Rumination is a maladaptive behavior in which the person regurgitates and then either chews and reswallows the vomitus or expels it from her mouth. The person who ruminates usually does so for up to 45 minutes after each meal. There are instances of life-threatening

rumination in which the persons may look emaciated because they lose vital nutrients by expelling the vomitus. Most of the cases of rumination in which the vomitus is reswallowed are nonlife threatening and are not uncommon with the SPH population. Although this type of rumination does not pose a major health hazard, you may want to have medical personnel examine the student periodically. There are several clearly undesirable aspects of rumination. One is that the student who ruminates is quite unpleasant to look at and to be around, and therefore, is likely to be socially ostracized. She typically has vomitus on her clothing and around her mouth and smells bad and may have patches of irritated skin around her mouth and face. The primary problem associated with rumination is that it is repetitive and nonfunctional self-stimulation that interferes with a student's acquiring appropriate and functional behaviors.

To treat nonlife-threatening rumination with a satiation procedure, provide the student with two to three times her normal portions at mealtime. If we allow her to eat until she is satiated, her rumination after the meal usually decreases from 50 to 90%. This decrease occurs because the reinforcer for rumination is the sensation produced by food in the stomach. There are some concerns about using satiation to treat rumination, namely that the student may gain weight or that quite a lot of food is required. Therefore, in addition to taking data on the rumination, it is a good idea to keep accurate data on the student's weight as well as on the weight of the food consumed at each meal.[12]

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[12](See next page for footnote)

The primary advantage of satiation is that it is a nonaversive procedure. A major problem, in addition to being only temporarily effective, is that the inappropriate behavior treated by satiation alone is generally not eliminated until a more aversive treatment is coupled with the satiation procedure. For example, although Foxx, Snyder, and Schroeder (1979) reduced rumination in two profoundly retarded adults using food satiation, the behavior did not reach near-zero levels until an oral-hygiene overcorrection procedure was added. We also run the risk that the reinforcer will be delivered following the undesirable behavior thereby reinforcing it. There are many aberrant behaviors such as self-injurious behavior, aggression, and extreme disruptiveness for which a satiation procedure is clearly inappropriate.

Level 2: Reducing Behavior with Mildly Aversive Procedures

Although reductive procedures in level 2 of the least restrictive treatment model are not very restrictive of the student's rights, it is still a good idea to obtain written approval from the student's legal guardians and your administration prior to using a level 2 procedure.

Negative Practice. Negative practice is a procedure in which we have the student practice the undesirable behavior repeatedly. The rationale for its use is that the physical effort involved in

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[12]The weight of the food the student consumes at a meal can be determined by a two-step process. Before the student eats anything, weigh the food, the containers it is in (e.g., plate, bowl, carton), and any bibs or napkins that are used. When the student has finished eating, weigh everything again, i.e., the containers, any food that is left over, and the bib or napkin since it will catch most of the food that may fall from the student's mouth or utensil. The weight of the food consumed is simply the difference between the first and second measures.

repeatedly performing the aberrant behavior will become so aversive that the student will stop exhibiting the inappropriate behavior in order to avoid the negative-practice consequence (Foxx, 1982a).

Negative practice can be effective in reducing an undesirable behavior and its effects can be long lasting. However, its use is only appropriate for a few misbehaviors because of a number of disadvantages. Because retarded persons usually are unwilling to practice the negative behavior, it often becomes necessary to guide them manually to perform the behavior. It is possible that the student may become combative during this physical guidance. Therefore, when manual guidance must be used, we place negative practice in level 3 of the treatment model. We also need to be concerned about the possibility that we are simply allowing the student to practice the undesirable behavior. To avoid this problem, examine the data; if the behavior has not dropped significantly, institute another procedure. Some aberrant behaviors are not at all suitable for treatment involving negative practice. For example behaviors that are potentially harmful to the student or to others, such as any form of sib, aggression, or disruptiveness, should not be considered for this treatment procedure.

Although there are disadvantages associated with the use of negative practice, there are some situations in which it could be an effective treatment procedure. The following example illustrates an appropriate use of negative practice. Sean is a 17-year-old severely retarded student who frequently goes through trash cans and then empties all the contents. After baseline data have been taken, we implement a negative-practice procedure. Whenever Sean starts to go through the trash, we will give him a firm reprimand, "No, hands off

trash!" Then we will take him to a corner, facing him away from classroom activities, and give him several trash cans to go through and to empty out. These will be ready ahead of time and will consist only of crumpled paper. Sean is told to go through each trash can and empty out its contents and that he cannot return to the classroom activity until he has finished. If he does not do the task or halfway does it as he turns around to try to get someone's attention, one of the teachers will manually guide him through the task at a fairly rapid pace giving him as little attention as possible. For example, she would avoid making eye contact with him or any positive statements (e.g., "Good") when he resumes the task. This procedure may not have much of an effect if Sean does not want to go back to the classroom activity. Therefore, a DRO procedure will be implemented throughout the day so that he is reinforced frequently when he does not go through the trash.

Exercise great care when you are considering using negative practice. As with the use of any treatment procedure, examine your data daily and modify your intervention if you do not see a significant change in trend or level from baseline conditions. It can be a useful way of reducing some undesirable behaviors. However, other reductive procedures could be used instead of negative practice. They avoid the potential problem of having the student practice the inappropriate behavior and are often more effective.

Extinction. Reinforcement will increase or maintain a behavior. If we withhold the reinforcer, eventually the behavior (regardless of whether or not it is appropriate or inappropriate) will decrease to its prereinforcement level. Extinction is simply the non-delivery of

reinforcement; no aversive consequences are delivered. As a treatment procedure, extinction seems relatively simple, but it is not always easy to implement. Whenever you decide to use extinction, it is very important that you explain to the change agents the properties that characterize a behavior undergoing extinction. Otherwise they may think the treatment is not working and so discontinue it. The following are several points to keep in mind and to tell others about whenever extinction is used.

1. Behavioral reduction is gradual; there is typically not an immediate decrease in the behavior. The student's history of reinforcement for engaging in the behavior influences the rate of behavior reduction. For example, if the student emitted the behavior often and was reinforced, it will be much more resistant to extinction than if she had only occasionally emitted it. In addition, if the behavior has been reinforced on an intermittent schedule, it is much more resistant to extinction than if it has been reinforced on a continuous (CRF) schedule. Therefore, before implementing an extinction program, first you could put the behavior on a CRF schedule and then withhold reinforcement. This procedure would lead to a more rapid response reduction. A second way to accelerate response reduction is to use extinction in conjunction with DRO, DRA, or DRI. Consider the following example. Tessa is an 11-year-old severely retarded girl who engages in a very mild form of self-injurious behavior (s-i-b) that consists of her biting her hand. Athough it has become calloused, no skin is ever broken by her biting nor is there ever any blood drawn. After conducting a situational analysis, it became apparent that Tessa bit her hand almost exclusively when she was

not the center of attention, e.g., when her 3-year-old niece was present. Therefore, treatment sessions were conducted in which Tessa's older sister and niece were involved in various play activities with Tessa. To begin with, Tessa's adult sister was instructed to attend to Tessa whenever she bit herself by saying such things as "Tessa, don't bite your hand," or "Tessa, let's play with this toy together." This part of the intervention was designed to put the behavior on a CRF reinforcement schedule so that it would decrease more rapidly. The second part of the intervention consisted of implementing the extinction procedure and a reinforcement component (DRO). Whenever Tessa bit her hand, her sister completely ignored her for 30 seconds by turning her back toward Tessa and continuing to play with the niece. She gave Tessa lots of attention at various intervals contingent on the absence of any sib.

2. An extinction burst is frequently apparent immediately after reinforcement begins to be withheld. With Tessa, we would expect the rate and intensity of her sib to increase when her sister started to ignore her each time she bit herself. With continued use of extinction, the response should start to decrease. This characteristic of extinction is extremely important to point out to persons who will be implementing the extinction program. Be sure to tell them that the behavior is likely to get worse before it gets better, but that it will get better. If you do not advise them of this point, they are likely to attend to the behavior (e.g., "Tessa, get your hand out of your mouth"), thereby strengthening it and making it even more resistant to extinction.

3. Particularly in the first few days of extinction, aggression

may occur. You may want to take frequency data on aggression. If it does not cease after a few days, you may want to implement an intervention for the aggression. During and shortly after the extinction burst in Tessa's biting her hand, her verbal and physical aggression increased. Extinction and DRO were used for verbal aggression; chair time out was used for her physical aggression. Eventually, the sib and aggression were decreased to very low rates.

4. After the response has been absent for a period of time in which there has been no intervening reinforcement, spontaneous recovery may occur in which the behavior reappears. This recurrence is transitory. Again, be sure to advise those individuals who are carrying out the extinction program of the possibility of its occurring.

Extinction can have a long lasting effect on a behavior and can be easier to implement than some treatment procedures because the change agents do not need special materials; they just ignore the undesirable behavior if it was their attention that maintained it. Another advantage is that extinction is a relatively nonaversive treatment procedure in that no aversive consequences are delivered. But because of the possibility of an extinction burst, in which the behavior may increase in frequency and intensity, and extinction-induced aggression, it is considered to be a level 2 procedure in the least restrictive treatment model. There are other disadvantages as well. First, the procedure is not immediately effective. Therefore, it is not the treatment of choice for behaviors that could be harmful to the student or to others which must be stopped immediately. A second problem is that the reinforcers maintaining the undesirable behavior can be very

difficult to identify, especially when the behavior is maintained on a very thin reinforcement schedule. There might also be several reinforcers that are maintaining the behavior. All of these must be withheld contingent on the occurrence of the inappropriate behavior if it ever is to be extinguished. To determine which reinforcers are maintaining the behavior, first select the event or object you think is maintaining the behavior and withhold it. If the behavior drops below baseline levels, you have probably identified one of the reinforcing contingencies. To be more confident that this reinforcer is functionally related to the behavior, reinforce the behavior again temporarily. If it increases and then decreases again when it is withheld again, we can conclude that we have identified one of the sources of reinforcement. Repeat this procedure for each event that is a possible reinforcer. Whenever you cannot determine which reinforcers are maintaining a behavior or have no way to control the reinforcing contingencies, use another reductive procedure besides extinction (Sulzer-Azaroff & Mayer, 1977).

Response Cost. Response cost is a reductive procedure in which specified amounts of reinforcers are removed contingent on the occurrence of an inappropriate behavior. Before we can remove a quantity of reinforcers, obviously the student must have a build up of reinforcers. For SPH students who have been token trained, we must first allow them the opportunity to accumulate tokens and to trade in some of them for backup reinforcers. Then we can use the contingent removal of a certain number of tokens to reduce future occurrences of the inappropriate behavior. For example, let's suppose that we have Joseph on a program in which he earns tokens for independence in self-

help skills such as combing his hair or putting on clothes without having to be prompted. He has many of these behaviors in his repertoire; the problem is that he is dependent upon prompts to perform them. Therefore, after he has built up a reserve of tokens, we institute a response-cost procedure in which Joseph loses a token each time he has to be prompted to perform one of these behaviors.

A modified version of the system is a procedure that Sulzer-Azaroff and Mayer (1977) call a bonus response cost. In this system, the student is given free tokens at the beginning of the treatment session or day. We could use tokens for those SPH students who are token trained, or we could use money for those who understand its use. For example, money has become a conditioned reinforcer for Joseph because it was frequently paired with special treats such as gum, pop, and a machine that has a lot of interesting bells and flashing lights (i.e., a pinball machine). Therefore, each morning we could give him 20 nickels. Whenever we have to prompt him, we take away a nickel. At the end of the day, Joseph gets to keep all the nickels that are left over. The next day, we give him a new batch of 20 nickels.

When using response cost, you need to decide on the size of the fine, e.g., how many tokens or nickels you will take away from Joseph when you have to prompt him. The intensity of the response cost should be determined empirically. Once you have selected a certain cost, if it does not effect the response reduction that you sought, do not increase the cost gradually because the student is likely to adapt to the gradual increase. To avoid this adaptation to the response cost, make the contrast between fines sharper. For example, the contingent removal of one token or nickel may not have decreased Joseph's

dependence on prompts. Rather than immediately increasing the fine to two, we should first return to baseline conditions, in which there are no fines for having to be prompted, for a period of time (e.g., a week). Then we impose a two-token or two-nickel fine. The sequence is thus one token, zero tokens, two tokens.

Response cost, like any other reductive treatment procedure, should not be used in isolation; we should combine it with a reinforcement component so that we can build up appropriate behaviors. Although it has led to rapid behavioral reduction in many cases, Sulzer-Azaroff and Mayer (1977) note that its reductive effect is not universal, and it may generate escape and aggressive behaviors in the student. You would consider using it only after more positive approaches have proven to be ineffective, if reinforcement reserve has been built up, and if each occurrence of the inappropriate behavior can be fined. Before implementing a response-cost system, you need to communicate the contingencies to the student which can be done in practice sessions similar to those in which you token train the student.

Timeout. Timeout from positive reinforcement is a reductive procedure that is similar to response cost in that both involve the withdrawal of reinforcement contingent on the occurrence of the undesirable behavior. Instead of removing specific amounts of reinforcers as in response cost, timeout involves removing reinforcement for a specific period of time (Sulzer-Azaroff & Mayer, 1977). There are two kinds of timeout: nonexclusionary and exclusionary. Nonexclusionary timeout allows the student to stay in the reinforcing environment, but denies him access to reinforcing

activities for a certain period of time. It is a level 2 reductive procedure in the least restrictive treatment model. Exclusionary timeout consists of contingently removing the student from the reinforcing environment. Since it is a more intrusive procedure, it is discussed further under level 3 treatment procedures.

To use timeout effectively, Foxx (1982a) outlines a number of details that need to be attended to. First, it is essential that the time-in area (e.g., classroom or lunchroom) be very reinforcing. A timeout procedure will not be effective in reducing a behavior if the environment is aversive to the student. For example, suppose a program has been implemented to increase Kelly's independence in cleaning up his room. He is not particularly fond of having to do the tasks as suggested by his noncompliance (e.g., just standing there even when given verbal and gestural prompts). If aggression is the target behavior we are trying to decrease, using timeout may actually function as a negative reinforcer that increases aggression because by hitting the teacher, he can get away from this unpleasant environment in which demands are placed on him. He might hit someone so that he can go into timeout and get away from the stressful learning situation. Since the environment does not have a high density of reinforcement, use of timeout is inappropriate and another reductive procedure must be implemented.

Second, when the student is in timeout, he should not be receiving any reinforcement. For instance, if we had Kelly sit in a chair for timeout, the chair should obviously not be facing a TV. We also would not let Kelly take his favorite game to timeout or talk to him while he is in timeout. Under these conditions, timeout is reinforcing rather

than nonreinforcing. This point is very important to emphasize to parents or teachers when you train them in how to use timeout effectively and in your follow up on the case. Consider the following situation. A week after training Tessa's mother in how to use chair timeout for Tessa's aggression, I learned that the mother gave Tessa cookies during timeout because she was being so good by sitting still. This example highlights the importance of monitoring the interventions for which you have served as a consultant. Train the change agent in how to take data and to implement treatment procedures; then check on them throughout the program to make sure that the intervention is being implemented correctly and consistently. Modify the program if necessary.

To ensure that timeout is nonreinforcing, we can make changes in the environment (e.g., turn the student away from an activity) or modify our own behavior (e.g., stop interacting with the student). Still, however, we may not be able to create timeout from positive reinforcement in some cases. For example, what we designate as a timeout procedure in fact may be reinforcing for a student who frequently engages in self-stimulation. Therefore, we inadvertently may be reinforcing the inappropriate target behavior. For students who frequently engage in self-stimulatory behavior or who like inactivity (i.e., doing nothing), timeout should not be attempted.[13]

A third consideration when implementing a timeout procedure is to keep its duration relatively short. Generally, the younger the student, the shorter is the duration of timeout. I have frequently

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[13](See next page for footnote)

used 2-minute timeouts, but have also kept them as short as 15 and 30 seconds. For older SPH students, a 2-minute timeout may be quite effective, although you may want to increase the duration to 5 minutes or possibly longer. In general, avoid timeouts that are over 30 minutes.

Fourth, even though you have specified the amount of time in which the student is to remain in timeout, he should not be released if he is engaging in an inappropriate behavior; otherwise you will reinforce inappropriate behavior. To avoid this potential problem, specify a change-over delay which is the length of time the student must refrain from engaging in undesirable behaviors if he was misbehaving when the time limit was up. For example, contingent on Kaye's food stealing, we decide to use a 2-minute timeout with a 15-second change-over delay in which the stolen food is taken away and her wheelchair is turned away from the table. She remains in this position with no interaction with anyone, at least for 2 minutes, but it could be longer. If she is sitting quietly when the 2-minute mark is up, she is turned around and can rejoin the group. However, if she is tantruming, she remains in timeout until she is calm for 15 seconds continuously. I have used change-over delays as short as 5 seconds (when the student otherwise

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[13]A timeout procedure is often used for aggression, but is an inappropriate treatment for docile students. I worked with an 18-year-old severely retarded young man who was aggressive when required to complete a task. His preferred behavior at other times was inactivity; unless prompted to do something, he just sat or stood for long periods of time without moving. Therefore, to consequate each occurrence of aggression, a procedure that required him to engage in a high-rate behavior was implemented. For 1 minute contingent on aggression, he was manually guided through a rapid stand up-sit down procedure. Although very tiring for the therapist, it effected an immediate and sharp reduction in his aggression.

would remain in timeout indefinitely because she did not refrain from engaging in inappropriate behavior for much more than a few seconds). You may want to go as long as 30 seconds in some situations.

Fifth, timeout should be applied immediately after the aberrant behavior; otherwise, again you may end up reinforcing the behavior. I observed an extremely disruptive, destructive, and aggressive severely retarded girl with Fetal Alcohol Syndrome in her school. The teacher at first tried to ignore Kristen's inappropriate behavior. As it got worse (the extinction burst), the teacher then decided to take her to the timeout room (an example of exclusionary timeout, a level 3 treatment procedure). She calmly took Kristen's hand and walked with her to the room; this process took over a minute. The teacher also commented that sometimes she walked around with Kristen to let her cool down before placing her in the timeout room. The problem with both of these situations is that timeout was not applied immediately. In the elapsed time, Kristen had the teacher's undivided attention and got to hold her hand as well. What was actually happening was that Kristen was being reinforced for her inappropriate behaviors.

Sixth, as with any treatment procedure, we should label the behavior and make a brief verbal statement. When using timeout for finger eating, we can say, "No finger eating" or "No, don't eat with your fingers." Then we say, "Go to timeout" or just "Timeout." There is not really anything else you need to say. Avoid talking with the student during timeout to ensure that it indeed is a period of nonreinforcement.

Seventh, although it is not as much of a problem for SPH students as with those who are higher functioning, we need to prevent other

students from attending to the student while she is in nonexclusionary timeout.

A final component of a timeout procedure, as with any treatment procedure is that you keep detailed records. In addition to having a precise description of the program and the target behavior as well as written permission to implement it, data should be taken on frequency of occurrence, time the student spent in time out (this duration will vary depending on how long it takes the student to satisfy the change-over delay requirement), and the initials of the person who implemented the procedure.

When you have decided to use a timeout procedure, you should try a nonexclusionary timeout first. There are three types of this level 2 timeout (Foxx, 1982a).

1. Timeout by withdrawing a reinforcer is useful for those situations in which a student is engaged in an activity he really enjoys. For example, when Matthew uses his fingers during mealtime, we can remove his plate and whatever food is in his hand. If Audrey starts to whine while her teacher is singing a song to her, the teacher can stop singing and turn his back to Audrey. This type of nonexclusionary timeout can be implemented immediately and minimizes the amount of interruption in the classroom, but will be effective only if the event removed is a powerful reinforcer for the student and if he is not sated.

2. Timeout by requiring the student to sit or stand in the corner can be implemented in two ways. One way is to use what Porterfield, Herbert-Jackson, & Risley (1976) refer to as contingent observation in which the student is required to sit or stand away from the activity.

For example, when students are involved in an activity together, such as making pudding for dessert, and one of them grabs something from another student, we can move the student back away from the activity table where he can watch the others but cannot himself participate. The other way is to have the student sit in a chair facing a corner or to stand facing the corner. Initially, you will need to take the student's hand and escort him rapidly to the timeout chair or corner. For a student who is resistant, you may need to stand behind him or even to cross his arms in front of him and hold his wrists to prevent his leaving timeout. Since holding the student in this way involves physical restraint, we now have a very intrusive (level 3) treatment procedure. You need to provide a clear description of the procedure and obtain written permission before using it.

3. Timeout by using the timeout ribbon procedure is a particularly useful form of nonexclusionary timeout because it can be used effectively with a group of students. Foxx (1982a) explains how to set up the program as follows. Give the students a ribbon (e.g., a ribbon wrist band that has Velcro tape on each end) to wear on their wrists. Whenever you reinforce a student, use labeled praise and point out that he is wearing the ribbon. For example, "Good job, Eugene, you stacked those papers all by yourself and you are wearing your ribbon." Then present an edible if you are using them. What we are doing is establishing the ribbon as a conditioned reinforcer. Once the ribbons have acquired reinforcing properties for the students (e.g., when they stop trying to take the ribbons off), you can implement the timeout procedure. Whenever a student engages in an inappropriate behavior, remove his ribbon and say, "No, Eugene, you threw the papers on the

floor, so you cannot have your ribbon." Take the ribbon away for the duration of the timeout, do not interact with him, and do not allow him to continue participating in the classroom activity. Return the ribbon and allow access to reinforcement at the end of the timeout period (allowing for a change-over delay when necessary). There are several advantages to the timeout ribbon procedure. It makes group treatment feasible because you do not have to worry about running out of timeout rooms or corners. Secondly, the presence or absence of the ribbon provides a clear signal to visitors about when it is okay for them to interact with the student. Thirdly, the clearly visible ribbons serve as a reminder to school personnel to reinforce students. Their absence will remind them about who is in timeout and should not be receiving attention. And fourthly, because the student can keep his ribbon on, even when he is at home, the parents can be taught the system which will help provide consistent programming across settings.

Level 3: Reducing Behavior with Intrusive Techniques

The severest and most intrusive reductive procedures are in level 3 of the treatment model. They should be used only after level 1 and level 2 procedures have been exhausted. Written permission must be obtained from the legal guardians, administrators, and when appropriate, a human-rights committee at your facility.

Exclusionary timeout. Exclusionary timeout is a more intrusive treatment procedure than any of those previously defined because the student is actually removed from the setting. Foxx (1982a) describes three kinds of exclusionary timeout. First, a separate timeout room can be used. It should have no reinforcing stimuli and ideally should be located close by so that consequation of the inappropriate behavior can

be provided as soon as possible. Be sure to remove any object the student might use that is potentially dangerous such as items that can be thrown or swallowed or objects with sharp edges. It should have adequate lighting and ventilation. In some cases you will want to pad the floor and walls; at the least you will want to have a carpet on the floor. A plexiglass window or one-way mirror is necessary so that you can observe the student (see Hanson, Tyler, & Hedge, 1976, for an inexpensive way to make a one-way mirror). If you are going to do anything besides wait just outside the timeout room, set a timer to remind yourself when the student can come out. A good place to put the data sheet is on the outside of the door.

There are a number of disadvantages to using a timeout room. Logistically it can be difficult to set up; a special room may not be available, and there may not be an extra person who can escort the student to the room. If the teacher escorts the student, then educational tasks are likely to be interrupted. In addition, it is virtually impossible to place the student in timeout immediately, and the student may even receive social reinforcement while he is being taken to the timeout room. There may be times when the student displays certain behaviors (e.g., self-injurious behavior, urinating, or smearing feces) while in the room that may require you to enter. By intervening, you are attending to the student which could nullify the effectiveness of the timeout program. It is also possible, although hopefully very improbable, that the timeout room might be used noncontingently by school personnel for their own convenience or that the prespecified duration of timeout is lengthened without prior consultation with the psychologist, guardians, and administrators.

A second form of exclusionary timeout is timeout behind a partition in the classroom. The advantage of this timeout area over room timeout is that the student can be consequated more quickly and there typically is less disruption of educational activities. However, if the student makes enough noise, she may disturb the other students and may be reinforced by their reactions.

A third type of exclusionary timeout is timeout in the hallway. It is not used often because the student can run away. It is best to avoid using this type of timeout unless the student is fairly docile and will follow instructions to stay in the hallway; the length of timeout also should be brief.

Do not use exclusionary timeout until less intrusive treatment procedures, including nonexclusionary timeout, have been tried first and unless you have data to indicate that they were ineffective.[14] If you do decide to use it, monitor its implementation closely.

Overcorrection. Overcorrection is a reductive treatment procedure first developed by Foxx and Azrin (1972) that has two essential components. The first is called restitutional overcorrection which is designed to be a realistic punishment consequence of an inappropriate behavior. It is used when the student's inappropriate behavior produces some sort of disturbance of something in the environment. It requires the student to overcorrect the disruption by restoring the environment to a state that is much improved than before the

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[14]There may be cases in which the student is new to your facility and is extremely combative. Provided that you have obtained the appropriate written consent and the student's previous setting has documented its treatment procedures, you may want to consider starting with exclusionary timeout.

inappropriate behavior. To determine what the student needs to do, first identify the specific and general disruptive events that resulted from the undesirable behavior then the behaviors the student needs to perform to improve the results of the misbehavior (Foxx, 1982a). For example, Elliott throws an object and is required to pick up the object and then to clean it off. Marcella tears pages out of a book and is required to tape them back in place.

The second component is called positive-practice overcorrection which consists of having the student repeatedly practice positive behaviors. It serves a reeducation function with the goal of teaching the student alternative appropriate behaviors. To determine what the student needs to do for this component, identify those appropriate behaviors that you want the student to practice; then require him to practice them contingent on the aberrant behavior. Do not use positive reinforcement when the student practices these appropriate behaviors, otherwise he might misbehave just to receive overcorrection. If we use positive practice in the previous examples, Elliott would have to practice picking up the object several times and then cleaning it off. Or we could have him straighten, pick up, and clean various objects in the room (especially similar ones), and apologize to people in the area. Marcella might have to repair several books and would be taught the correct way to look at a book. Note that positive-practice overcorrection is the opposite of negative practice in which the student repeatedly performs an inappropriate behavior.

Both componenets of overcorrection are frequently used to toilet train SPH students. If a student has an accident, we would have him change into clean clothing and wash out his pants (restitution) and

then rapidly practice using the toilet appropriately by going to the toilet, pulling down his pants, standing (or sitting) in the appropriate place for several seconds, pulling up his pants, walking out of the bathroom, and then repeating the process again. If the student has an accident on the floor, we also could require him to mop it up.

Public disrobing also has been reduced by overcorrection (Foxx, 1976). For example, if a female student started to remove her clothes in the classroom, she would have to get dressed again and wear extra clothing (e.g., add panty hose, slip, and belt). Then she would have to improve the appearance of her female classmates by buttoning or zipping unfastened clothing or by combing their hair.

Overcorrection also can be used for psychological as well as physical disturbance. Foxx and Azrin (1972) used an overcorrection procedure to decrease disruptiveness by having the retarded persons apologize to the person they had disturbed and then apologize to everyone who had been present.

The specific response requirements in overcorrection will vary depending on the target behavior. However, there are a number of common features to all overcorrection procedures (Foxx, 1982a; Sulzer-Azaroff & Mayer, 1977).

1. As with any other reductive treatment procedure, present a verbal reprimand, in which you label the behavior, immediately following the undesirable behavior, e.g., "No tearing the book!"

2. Use overcorrection consistently and immediately every time the aberrant behavior occurs. Such immediacy provides a period of timeout from positive reinforcement and promotes extinction because the student

has little or no time to be reinforced by the results of her inappropriate behavior. For example, if overcorrection were used for Tara's food stealing, we immediately would prevent her from eating the stolen food and have her return it plus some of her own food. Tara would not have a chance to obtain the reinforcer, i.e., the food.

3. The verbal instructions you use to tell the student the corrective actions she is to perform, or even just your presence since you are with her during the entire procedure, could be reinforcing. Therefore, you need to minimize this attention by following three steps. First, present each instruction only once using manual guidance if she does not respond within a few seconds. Second, make each direction brief; a short phrase will usually suffice. And third, be sure to use a neutral tone of voice in order to reduce the reinforcing value of your talking to the student. Inflection in a voice, even when it is loud and stern, can be very reinforcing to SPH students. Therefore, present instructions during overcorrection with no inflection or affect. To make yourself sound like a robot is important, but will take a bit of practice.

4. Have the student perform the overcorrection acts rapidly which will add to the aversiveness of the procedure. Use graduated guidance to ensure that the student goes through the overcorrection procedure. It differs from manual guidance in that the amount of hand pressure you apply will vary every few seconds depending upon the student's behavior. Foxx (1982a) describes three parts of graduated guidance. In full graduated guidance, keep your hands in full contact with the student's. If the student resists performing the overcorrection sequence, apply enough pressure against her resistance to counteract

it. Then reduce this pressure until she stops resisting. In partial graduated guidance, just use your thumbs and forefingers to guide her hands. Finally, when the student no longer resists when you use partial graduated guidance, begin using shadowing. In shadowing, you do not actually touch her hands, but you do follow her closely through the sequence so that you can use partial or full graduated guidance if necessary. After using overcorrection over a period of time with a student, you may be able to fade the full, then the partial graduated guidance, until you only need to shadow the student's movements during the overcorrection sequence. For some students, full graduated guidance may be necessary each time overcorrection is used.

For several classes of undesirable behavior, there are certain types of overcorrection procedures to follow. Foxx (1982a) outlines these for students who: (a) are agitated, aggressive, or disruptive, (b) engage in oral-related inappropriate behaviors, and (c) engage in stereotyped repetitive acts such as self-stimulation or self-injurious behavior (sib).

Whenever a student becomes upset or aggressive, engages in sib, or becomes extremely disruptive by screaming or making loud noise, she must overcorrect by remaining quiet and relaxed for a predetermined period of time. Therefore, we first would require the student to lie down quietly until she has calmed down and then to complete the overcorrection sequence. If the student again becomes upset while she is performing the overcorrection acts, have her lie down again. This calming-down period always should be done first with agitated and disruptive students before continuing the overcorrection sequence. For example, the overcorrection procedure for a student who bites others is

to have the student lie down on a mat or bed, brush her teeth with an oral antiseptic, cleanse and medicate the place where she bit the person, apologize to the person and to others in the area, and finally, practice appropriate ways of interacting with people.

A second example is of the overcorrection procedure to use with Benjamin who engages in sib that consists of his slapping his face. The specific disturbance here is that his face is covered with swollen red welts. The general environmental disturbance is that he becomes agitated when he hits himself; therefore he does not attend to educational activities and generally disturbs his peers. Our first step in this situation is to have Benjamin lie down on a mat until he becomes calm. This requirement will help him to calm down and should serve as an aversive consequence since it is timeout from reinforcement (provided that the classroom environment contained reinforcing events). For the restitution component of the treatment procedure, we will have him hold an ice pack to the place where he slapped himself. This part serves a dual purpose by reducing any swelling and by being a negative consequence since the feeling of cold ice is aversive to most people. We also will have Benjamin hold the ice pack to his face while he is lying down. For the positive-practice component, we need to determine what appropriate behaviors we want him to practice and decide to try to bring his hands under instructional control. Therefore, we require him to move his arms into one of three positions, up, sideways, or straight, when we tell him to. (More detail on how to accomplish this instructional contol will be discussed shortly.) Barnard, Christopherson, and Wolf (1976) used a different type of overcorrection procedure for head banging which consisted of applying an ice pack to

the head for 3 minutes, washing the bumped area for 2 minutes, drying the head for 1 minute, and then combing or brushing the hair for 1 minute. This procedure rapidly reduced head banging in the 3 year old and the 4 year old, but not in the 18 month old.

Whenever a student places a potentially harmful object in her mouth, this unhygienic oral contact is overcorrected by cleansing the mouth and lips with an oral antiseptic. This procedure is appropriate for biting (self or others), chewing or mouthing objects, and eating inedible substances. For example, consider scavenging, a behavior that includes both coprophagy and pica. The overcorrection procedure for coprophagy, the ingestion of fecal matter, entails cleansing the student's mouth and hands to remove the fecal matter (restitution) and then requiring her to flush toilets and mop the area where the fecal matter was obtained. For pica, the ingestion of inedible substances such as trash or cigarette butts, use the same overcorrection procedures except require the student to pick up and throw away the trash or empty and clean ashtrays, whichever is applicable (Foxx & Martin, 1975).

When the student's inappropriate behavior does not disrupt the environment, only positive-practice overcorrection is used. Therefore, we do not have a restitution component for self-stimulating behaviors, with the exception of mouthing and sib for which we include both restitution and positive practice. When the student's undesirable behavior consists of stereotyped repetitive acts, overcorrection consists of having him move the body part he used in the inappropriate behavior only when instructed to do so rather than when he engaged in the repetitive act on his own. A specific type of overcorrection is

used for each type of self-stimulation depending on the movement of which body part we want to bring under instructional control. Foxx (1982a) provides the following examples of overcorrection procedures for several types of self-stimulation.

When a student randomly moves his head from side to side, the behavior is called head weaving. To conduct the overcorrection procedure, gently restrain the student's head. Once his head is still, instruct him to move his head up, down, or straight. Use full or partial graduated guidance to move his head in that direction if he does not respond to your instruction within a few seconds. Use shadowing if he voluntarily moves his head in the direction you instructed. Have him hold his head in each position for 15 seconds; then instruct him to hold his head in a different position. In the early stage of treatment, the overcorrection sequence might last 15 to 20 minutes. When the head weaving is reduced to low levels, then you can begin to shorten the length of time involved.

Body rocking occurs when a student rocks forward and backward continuously while seated in a chair. Have the student move the upper part of his body forward in the chair and hold that position for 15 seconds; then have him move back and stay in contact with the chair for 15 seconds. Continue having him perform these alternating movements for 15 to 20 minutes using any of the three parts of graduated guidance as necessary. Shorten the time involved in completing the overcorrection sequence when body rocking has dropped to low levels.

For hand flapping (rapid flapping of hand(s) in air), hand gazing (staring at hand held up close to eyes), and paper flipping (continuous turning of pages), have the student lift her arms to various positions

and to hold them at each for 15 seconds. Continue this sequence, using full and partial graduated guidance and shadowing as necessary, for 10 to 15 minutes. Decrease the required time for the student to perform the overcorrection acts when the target behavior reaches low rates.

The available research to date suggests that overcorrection brings about very rapid and long-lasting effects; however, it does have its disadvantages (Foxx, 1982a; Sulzer-Azaroff & Mayer, 1977). First, because it is a complex procedure (e.g., using graduated guidance appropriately and tailoring the components to fit each unique case), there is the possibility that it will not be implemented correctly. School personnel who interact with the student will need to be individually trained (see Foxx & Azrin, 1973a, for a model for staff training) and monitored frequently; therefore, a considerable amount of your time as the consultant is necessary. Second, the undivided attention of a change agent is required for a substantial block of time. This time involvement is particularly problematic for high-rate behaviors or for settings in which few personnel are available. Arrangements will need to be made for an additional person to be present during the beginning of treatment, or you will need to use a different reductive procedure. And third, because overcorrection is so physically intrusive, it is inappropriate for strong students who resist graduated guidance. Avoid using excessive force; it is best to wait until any violent resistance subsides.

Overcorrection is like any other reductive treatment procedure; its effects will be more rapid and long lasting when it is combined with a reinforcement procedure (DRO, DRI, or DRA) that is in effect throughout the day, but not during the overcorrection sequence. It is

essential that the student be reinforced for engaging in appropriate behaviors either on a continuous or intermittent schedule depending upon whether we are focusing on increasing or maintaining the desirable behavior.

Physical restraint. Physical restraint is an intrusive level 3 procedure used almost exclusively to treat severe cases of self-injurious behavior (s-i-b) and occasionally to treat dangerous and highly disruptive behavior. Foxx (1982a) defines two types of physical restraint. In behavioral physical restraint, the student is prevented from moving parts of her body for a brief prespecified period of time (usually no more than 30 minutes) contingent on the occurrence of the aberrant behavior. It is used as a negative consequence and is designed to reduce the future occurrence of the behavior. It is a programmatic intervention in which we collect treatment data.

Custodial physical restraint, however, is not used as a consequence. It is a noncontingent procedure in which the student is prevented from moving parts of her body noncontingently and for an unspecified period of time. One type of custodial physical restraint is ordered by a physician and is used in institutions to subdue agitated residents, typically by strapping the person to his bed and injecting a tranquilizer. This restraint usually remains in effect until the physician cancels it, making it possible for the person to remain in restraint even when he is no longer agitated. A second type of custodial restraint involves the use of restraint to prevent sib. For instance, a head banger may wear a protective helmet (that looks like a bicycle or motorcycle helmet) that is locked so that it cannot be taken off. A person who hits his face or bites his hands or arms

may wear arm splints that prevent him from bending his arms. Such persons often wear their restraints both day and night. Although these custodial restraints may prevent sib from occurring (a head banger may still bang his head against things, but he will not sustain as much, if any, injury), they do pose several problems. First, the restraints are likely to restrict a student's involvement in various educational activities. For example, a person in arm restraints cannot feed himself. Second, the restraints could cause muscle atrophy if the student wears them for long periods of time. Third, if the student struggles against the restraints, he will become stronger and perhaps more difficult to manage because, in effect, he is doing isometric exercises. Fourth, the restraints themselves may become reinforcing over time. I worked with a severely retarded adolescent, Peter, on an inpatient basis who bit his hands to the point of bleeding if he did not wear his arm restraints. The restraints looked like casts that a person with two broken arms wears. They were straight and went from his wrists up to his arm pits. The interesting point is that Peter held them on himself with his fingers. If he opened up his hands, they fell off. They apparently had become reinforcing. The sheer weight of the restraints had caused Peter to develop large shoulders. He looked like a swimmer rather than someone who did nothing with his arms except hold on two arm restraints. This example brings us to a fifth problem with custodial restraints. They are permanent (until their use has been faded) fixtures that make it quite obvious that the person is severely handicapped, thus presenting a significant barrier to normalization. <u>Custodial restraints should not be used except for extreme cases</u>.

Foxx (1982a) discusses two ways to implement behavioral physical restraint: manual restraint and mechanical restraint. Both of these are used contingent on a certain aberrant behavior and for a preset period of time. To use manual restraint, in which you use your hands and body, first take baseline data, and then decide how long to use restraint for each episode. In the following example, we will use 5 minutes. Whenever a student hits himself or makes the attempt, say, "No, don't hit yourself," then immediately restrain his hands with your hands. If you stand behind him, you can hold his arms to his sides and also avoid making eye contact; do not say anything else to him. If the student starts to resist, continue to restrain him. Release the student at the end of the 5-minute interval if and only if he is not struggling. If he is still struggling, continue to restrain him until he has been calm for a period of time (e.g., 5 to 30 seconds). This feature is like the change-over delay in a timeout procedure. As you release the student's arms, again say, "Don't hit yourself." Then continue the educational activity he was involved in before the restraint being sure to provide a dense schedule of reinforcement (e.g., DRA). If the behavioral physical restraint did not decrease the sib, it may be that he found the struggling or physical contact to be reinforcing. To solve this problem, you could increase the duration of physical restraint, use a form of wrestling or physical contact as a reinforcer for desirable behavior, or use a mechanical restraint such as a strap or helmet.

The following case is an example of the contingent use of mechanical restraints. Bryant is a 2-year-old severely retarded boy who is blind. One of his undesirable behaviors is taking his

forefinger and poking it repeatedly at the sides and top of his mouth. This behavior leaves red marks that eventually turn into sores. Whenever Bryant pokes his face, we say, "No, don't poke yourself," then immediately slip tiny socks or mittens over one or both hands depending on how many he used. While these are on, do not interact with Bryant. Remove them at the end of 2 minutes, and again say, "Don't poke yourself." Since Bryant has virtually no behaviors in his repertoire other than self-poking, we must teach him other responses. We can begin by using manual guidance to occasion approximations of terminal behaviors (such as pressing down on a typewriter-like musical toy) and reinforce these on a CRF schedule.

The primary advantage to using behavioral physical restraint is the immediate and complete suppression of the aberrant behavior; it cannot occur during the procedure. Use of contingent restraint also may eliminate the undesirable behavior and have a long-lasting effect. As with any reductive procedure, there are a number of disadvantages as well. The restraint may become reinforcing and the student's struggling may create a stronger student who might, in turn, be more difficult to manage. When you use manual restraint, there is the possibility that someone could be hurt. You would not want to use it with large, aggressive students; a timeout room would be a more reasonable alternative. As with overcorrection, manual restraints require a great deal of time to implement. This time commitment is a definite problem when there are not enough educational personnel. Although behavioral physical restraint, by definition, involves restraint contingent on the occurrence of a severe behavior problem, it might be used noncontingently in a capricious or punitive manner when

the restraints are mechanical devices.

In summary, do not use a physical restraint unless the behavior is clearly serious enough to warrant its use and other less intrusive reductive procedures have been ruled out. As with any intervention, take data frequently and document what you are doing. As with any level 2 or level 3 reductive procedure, be sure to obtain the appropriate written permission. Finally, be certain that all change agents who will interact with the student have been thoroughly trained in how to use it. It is advised that school personnel role play and actually practice restraining each other while you are observing and providing corrective feedback. Monitor their use of restraint throughout the intervention.

Chapter 4

TREATMENT OF SPECIFIC TARGET BEHAVIORS

With a thorough understanding of goal selection, behavioral objectives, data collection, treatment procedures for teaching, increasing, and decreasing behaviors, and techniques for promoting maintenance and generalization of behavior change, we are ready to put it all together to design effective interventions for SPH students. Numerous examples have been presented throughout this manual to illustrate treatment procedures for a variety of behaviors you are likely to target when working with the SPH population. This chapter is designed to provide more information on interventions that have been conducted with this population for specific behavioral domains.

There is really no single procedure to use for a particular behavior. You have a number of options when designing treatment programs; your choice will depend upon the characteristics of each student and the setting (e.g., how many staff are available to work with the student, how much training they have had in the contingent application of behavior-management techniques, and how much time you have as a consultant to monitor the intervention). When considering which behavioral technique to use for decreasing a behavior, follow the least restrictive treatment model. In general, use positive approaches before implementing more intrusive procedures. Even when using aversive techniques, be sure to include a reinforcement component.

Toileting Skills

Behavioral techniques for developing toileting skills in SPH students fall into two basic categories: (a) decreasing inappropriate

toileting behaviors such as accidents and (b) increasing appropriate toileting behaviors such as self-initiated toileting (without prompts). A variety of procedures, such as verbal reprimand, response cost, timeout, and overcorrection, have been used to decrease inappropriate toileting behaviors (see McCartney & Holden, 1981, for a review). The use of overcorrection to reduce toileting accidents has already been presented on pages 120-121 in the previous chapter.

There are at least three skill areas necessary for appropriate toileting: (a) approaching the toilet, (b) dressing skills associated with toileting, and (c) eliminating in the toilet. A person who is fully independent must be able to go to the bathroom on his own without having to be prompted, lower his pants and underwear, eliminate in the toilet, use toilet paper appropriately, and put his clothes back in the proper place (McCartney & Holden, 1981). Most of the research on toilet training has focused on reinforcing appropriate elimination. Since we need to be concerned about immediacy of reinforcement, we have a bit of a problem if we do not detect when the student has eliminated either in his pants or in the toilet. It is for this reason that various signaling devices have been developed (see Azrin, Bugle, & O'Brien, 1971, for a detailed description). These are available commercially[15] or can be constructed at a lower cost (see Yonovitz & Michaels, 1976). The advantage to using such devices, in addition to immediate detection and hence immediate reinforcement, is that you will not have to keep checking the student's pants with your hand. Such

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[15]The Potty Alert and Pants Alert each produce auditory signals when a urinary response occurs. Further information is available from: BRS/LVE; Division of Tech. Serv., Inc.; 5301 Holland Drive; Beltsville, MD 20705; (301)474-3400.

manual checking is not much of a problem when you have young students, but does pose some concern for older students. If you have a student who has difficulty because of misdirected urinations (i.e., he misses the toilet), see Siegel (1977) for a treatment procedure.

Teaching dressing skills associated with toileting typically includes graduated guidance and then fading prompts as the student becomes more independent (e.g., Azrin & Foxx, 1971; Smith, Britton, Johnson, & Thomas, 1975). Do not teach these skills in isolation such as having the student practice pulling his pants partially down and then back up again in his room. Rather, we must teach the skills in the bathroom and within the context of the chain of toileting behaviors.

Approaching the toilet is an important part of the chain since we want the student to go to the bathroom on his own without having to be taken there by a teacher. McCartney and Holden (1981) describe a good way to teach approaching behaviors by using backward chaining. First, break down approaching behavior into components (e.g., approaching the toilet from 1 foot away, 3 feet, 30 feet, etc.). Training starts with the last link in the chain which is elimination, which as the terminal behavior, will be reinforced on every trial. When the student has performed this final link reliably, he is required to perform the previous link (e.g., approach the toilet from 1 foot away) and then the final link (i.e., eliminate) before being reinforced. When the student has chained all the components together, he should be able to approach the toilet from any location, ideally without any prompts from the teacher. This goal for complete independence in toileting is not attainable for all SPH students. For some of them, a reasonable goal

is for them to approach the toilet and complete the toileting sequence after a direct verbal prompt (e.g., "Go to the bathroom, Samuel"). Of course we are not satisfied if there is only one bathroom that Samuel will use, i.e., the one in which training occurred. Therefore, training sessions should take place in a number of different bathrooms including those in the natural environment (e.g., at home or at a store).

For a comprehensive toilet-training procedure, see the program described by Azrin and Foxx (1971) and Foxx and Azrin (1973a, 1973b). The major behavioral procedures of their program are as follows:

1. Ensure that you have a distraction-free setting since competing activities may interfere with the student's performance.

2. Provide positive reinforcement for appropriate toileting behaviors. Ahead of time, find out what are reinforcers for that particular student; be sure to use a variety of reinforcers and pair each with behavior-specific praise. Thin the reinforcement schedule after the student has acquired the skills.

3. Keeping in mind the fact that the contingent delivery of frequent reinforcement wil strengthen the reinforced responses, we want to increase the number of opportunities for the student to urinate. Therefore, give him something to drink about every 5 minutes. I have used a variety of liquids as reinforcers for a different target behavior such as a prevocational task, thereby increasing the desired response to an educational task as well as the number of opportunities to reinforce correct toiletings. What I had, then, was two treatment programs going on at the same time, although the primary one was the

toilet training.

4. You need to detect appropriate elimination as soon as possible so that you can reinforce it immediately and not some intervening behavior. This detection often can be accomplished by close visual observation, but you may want to use a mechanical signaling device.

5. Start out by using prompted practice trials in which you have him go to the bathroom about every 10 minutes. Have him stand in front of or sit on the toilet for about 5 minutes unless he urinates within the first minute.

6. Use verbal instruction and graduated guidance if necessary in teaching the component skills. Fade prompts as the student learns the skills.

7. Conduct dry-pants checks about every 5 minutes. (I usually do a dry-pants check every 1 to 2 minutes if the student did not urinate on the previous practice trial, then prompt another practice trial before another 10 minutes are up.) You can have the student touch his own pants, touch his pants yourself, or use a detection device. If the pants are dry, deliver a reinforcer. Fluids are especially nice to use.

8. When accidents occur, use restitutional and positive-practice overcorrection.

9. Teach dressing and undressing skills and approaching behaviors by using chaining and shaping procedures.

10. Take follow-up data.

For cases in which nocturnal enuresis (i.e., bedwetting) is a problem, refer to Azrin, Sneed, and Foxx (1973) for a description of a treatment procedure.

When implementing a toilet-training program, be sure that your selection of dependent measures matches your goals. For example, if your goal is for the student to use the toilet appropriately without having to be prompted, frequency of accidents by itself is an inadequate measure. Rather, the frequencies of both accidents and self-initiated toiletings should be recorded (McCartney & Holden, 1981).

Although complex toilet-training programs are available, you need to consider how much staff time is available. For your particular case, you may only need to implement some of the components. Therefore, simplify the treatment and take accurate data. If the intervention works, great; if not, analyze what the problem is, refine your program, and add additional components if necessary.

Self-Care Skills

Many of the goals we set for SPH students are in the area of personal maintenance since self-care is the most basic and essential of daily living skills. The most basic skills in this area are feeding, dressing, and toileting. At a more difficult level are grooming and hygiene skills such as noseblowing, hand and face washing, toothbrushing and using mouthwash, showering and bathing, basic hair care such as combing, washing, and drying, using deodorant, tending to menstrual hygiene, along with many other skills (Snell, 1981). In general, we want to train students in natural settings where they ultimately will need to demonstrate the appropriate behaviors. When training in realistic settings is not possible, and training is conducted in the classroom, it is essential that we take generalization probes to check to see if the student performs the skills out in the

real world. Although we may be quite successful in teaching a student to wash her face and hands in the school restroom, she may not demonstrate this skill when she goes home because the environmental stimuli may be different. If we find that the student does not exhibit the desirable behavior in a natural setting, we must continue our intervention to plan for generalization.

All of your interventions will need to be tailored to the individual needs of each student. However, it is helpful to know how others have taught self-help skills. There are a great many references in this area for SPH students. For a comprehensive review of behavioral strategies to teach self-care skills, one place you might start is with Snell (1978) and Westling & Murden (1978). A few additional references for specific self-help areas are as follows: (a) teaching dressing skills (Azrin, Schaeffer, & Wesolowski, 1976), (b) teaching self-feeding skills (Azrin & Armstrong, 1973; O'Brien & Azrin, 1972), (c) decreasing inappropriate mealtime behaviors (Barton, Guess, Garcia, & Baer, 1970), and (d) teaching toothbrushing skills (Horner & Keilitz, 1975).

Self-Stimulation

Self-stimulation has been decreased by a variety of different procedures such as extinction, DRO, and punishment including response interruption, verbal reprimands, timeout, isolation, overcorrection, slaps, and electric shock. However, empirical studies have revealed some contradiction in the relative efficacy of these treatment procedures. The problem in trying to determine which technique is most effective is that there is an infinite number of idiosyncratic treatment procedures that are examples of each behavioral principle,

each of which can be applied in varying degrees of power.

The general consensus, however, is that punishment for self-stimulation in combination with positive reinforcement for alternative behaviors is an effective treatment. When designing an intervention for self-stimulation, be sure to include a reinforcement component and to consider the least restrictive treatment model when selecting reductive procedures. Before implementing an intervention for self-stimulation, conduct a situational analysis which will include observations to determine the situations in which it occurs, its behavioral dimensions (e.g., topography, frequency, and duration), and its consequences. If you find that self-stim occurs only under one condition, treatment may consist simply of restricting the student from this condition provided that it is not an essential activity such as eating. In your situational analysis, if you find that people routinely provide a consequence for the student's self-stim, consider the possibility that this consequence may be reinforcing it. Therefore, your first treatment should include withholding the consequences (O'Brien, 1981).

Much of the time, you may find that the student's self-stimulation occurs in a variety of situations and that there are apparently no consequences that are maintining it. Under these circimstances, it is probably best to design a treatment program recommended by Foxx and Azrin (1973b) which includes the following components:

1. Use response interruption when the self-stimulatory behavior occurs.
2. Prompt the student to perform adaptive behavior.
3. Punish self-stimulation by using a reductive procedure.

4. Teach the student adaptive behavior.

5. Reinforce the student for performing adaptive behavior.

One of the reductive procedures frequently used for self-stimulation is overcorrection. If the self-stimulatory behavior consists of mouthing, restitutional overcorrection can be implemented. Lamal (1976) found that Listerine delivered from a spray bottle reduced a 5-year-old profoundly retarded girl's handsucking and chewing behavior to low levels. Furthermore, its use was faded until it only needed to be used three times a day.

Another reductive treatment procedure you may want to use is visual screening which consists of the therapist's placing one hand over the student's eyes while simultaneously holding the back of her head with the other hand. The duration of visual screening may be as short as 5 seconds, but may be longer if the student is resisting at the end of the interval. McGonigle, Duncan, Cordisco, and Barrett (1982) found this procedure to be an easily administered, effective, and durable treatment for reducing a variety of stereotypic behaviors.

Self-Injurious Behavior

To provide a thorough review of self-injurious behavior (s-i-b) would take an entire volume in and of itself. What I will do in this section is provide a very brief review of sib and give you some references that will be helpful as you design interventions.

The greatest success in treating sib has been found with methods based on principles of operant conditioning; however, there have been mixed findings (see Iwata, Dorsey, Slifer, Bauman, & Richman, 1982, and Schroeder, Schroeder, Rojahn, & Mulick, 1981, for reviews). The only interventions that consistently have been effective in treating sib are

those in which aversive stimulation, e.g., water mist, ice application, lemon-juice therapy, and aromatic ammonia, have been used (Corte, Wolf, & Locke, 1971; Dorsey, Iwata, Ong, & McSween, 1980; Drabman, Ross, Lynd, & Cordua, 1978; Sajwaj, Libet, & Agras, 1974; Tanner & Zeiler, 1975). As has been emphasized throughout this manual, however, we need to follow the least restrictive treatment model and limit the most aversive and intrusive procedures to situations in which level 1 and level 2 techniques have been used and found to be unsuccessful.

To keep from having to attempt a seemingly endless series of interventions for sib, which is a multiply controlled operant, Iwata et al. (1982) recommend that we first identify the functional properties of self-injury on a pretreatment basis by observing the student's behavior in well-defined analogue environments. Therefore, we determine the events that are currently maintaining the sib and then select a treatment strategy. For example, if we find that sib is highest during the Alone condition, we might assume that the sib is a form of self-stimulation. Therefore, our intervention might include the use of sensory reinforcers, e.g., bright flashing lights, contingent on the absence of sib. We also might provide the student with alternative activities such as toy play which would set the occasion for more benign sensory activity. For example, if the student constantly chewed and sucked on his hand to the point that there was chronic skin breakdown and infection, we could put his hands on a soft toy that makes a sound when manipulated and reinforce him for toy play. Favell, McGimsey, and Schell (1982) implemented this procedure and found that the student switched from mouthing his hand to mouthing the toys and finally to appropriate toy play.

Whenever you have a student who engages in self-injurious behavior, you need to specify the specific environmental conditions and consequences that are differentially associated with the sib; the model proposed by Iwata et. al (1982) might be a helpful pretreatment analysis for you to use. (Similar models have been proposed for stereotypy by Adams, Tallon, & Stangl, 1980, and for pica by Madden, Russo, & Cataldo, 1980.) If we design interventions that are based on this information about the enviornmental context and the maintaining conditions, there are at least four potential advantages as outlined by Favel et al. (1982). We can: (a) circumvent ineffective and perhaps deleterious treatments, (b) suppress sib more effectively than the present mixed results with DRO and DRI procedures, (c) increase the chances that generalization and maintenance of treatment gains will occur, and (d) avoid the use of aversive procedures that may not always be necessary.

Chapter 5

MAINTENANCE AND GENERALIZATION OF BEHAVIOR CHANGE

Regardless of how effective our intervention was in teaching, increasing, or decreasing a behavior, the significance of this behavior change is minor if the behavior deteriorates after the intervention is withdrawn or when the student is in a different setting. For example, although we may have taught a student to pour her own drink in an analogue setting, this behavior gain is really no big deal if she does not pour her own drink when she is actually in the school lunchroom or in the kitchen at home. When we evaluate the effectiveness of our intervention, there are at least three components that we need to consider: (a) was there enough of a behavior change, (b) did the behavior change persist across time, and (c) did the behavior change transfer to nontreatment settings? The first component refers to our behavioral objective and whether or not we reach the criterion. The second refers to maintenance and the third to generalization. Particularly for SPH students, their modified behavior is typically situation specific and very responsive to setting events, reinforcement probabilities, and discriminative stimuli that operate in different settings. Therefore, the modified behavior is unlikely to persist over time or to transfer to other settings if we discontinue treatment procedures abruptly once the desired level of the behavior has been reached. If maintenance and generalization are desired, then planning for their occurrence needs to be an integral part of our treatment program. Maintenance and generalization are discussed separately here, although in actuality, the procedures that facilitate their occurrence

are intertwined.

Maintenance

There are four features that we should incorporate into our interventions to help ensure that the modified behavior maintains over time: (a) overlearning, (b) thinning of the reinforcement schedule, (c) delay in presenting reinforcement, and (d) fading of the artificial behavioral consequences. When we first implement treatment, we reinforce desirable behavior on a continuous (CRF) schedule. Once the objectives for both accuracy and fluency have been met, it is important to have the student perform the behavior a number of times and to reinforce him on a CRF schedule. This overlearning, which requires the student repeatedly to perform the behavior, will help the behavior to persist over time (White & Haring, 1980).

Next we need to reduce the reinforcement density by making the delivery of reinforcement more infrequent. Moving from a continuous or very dense schedule to intermittent reinforcement is called thinning the reinforcement schedule. This process can be done by increasing the number of responses the student must perform (a ratio schedule) before being reinforced or by increasing the amount of time that must pass before a response can be reinforced (an interval schedule). These schedules of reinforcement were discussed in the chapter on "General Treatment Procedures." To keep the behavior from disintegrating, thin the reinforcement schedule gradually and progressively. If the student's behavior stops abruptly and this disruption is accompanied by emotional responses during this process, thinning probably has taken place too rapidly. To remedy this problem, reinstate a denser reinforcement schedule (Sulzer-Azaroff & Mayer, 1977).

A third way to facilitate maintenance is to postpone the delivery of reinforcement. At the beginning of our intervention, we want to present a reinforcer contingent on the appropriate response immediately so that we do not inadvertently reinforce an intervening response. After the behavior has been established firmly in the student's repertoire, however, we want to introduce a delay in presenting reinforcement, since immediate reinforcement usually does not occur in the natural environment. There are several ways to delay reinforcement (Sulzer-Azaroff & Mayer, 1977).

1. Increase the size of the response requirement. As these behavioral requirements are expanded, a delay factor is automatically introduced. For example, we may reinforce Conrad every time he completes one wipe of the table with a sponge. At the next level, we require him to wipe off one table completely before reinforcing him. Finally, Conrad must wipe off several tables after lunch before reinforcement is delivered.

2. Add a time interval between the performance of the behavior and the delivery of reinforcement. After Conrad finishes wiping off the lunch tables, we could wait 5 minutes before reinforcing him.

3. When we are using tokens, we could increase the time interval between token accumulation and token exchange. In the early stages of the intervention with Conrad, we allow him to exchange his tokens for various tangibles and activities only a few minutes after he earned them. Later, we will require him to wait 15 minutes, then 30 minutes, and eventually up to 2 hours before being able to exchange them.

When using reductive treatment procedures with SPH students, behavioral consequences will be applied immediately during the early

phases. Gradually, though, we want to introduce a delay in providing these consequences. Such a delay can be accomplished by using a bridging stimulus which bridges the time between the emission of the response and the delivery of the consequence (Foxx, 1982a). For example, to use a bridging stimulus with a nonambulatory student who engages in pica, we can immediately remove the object or substance from her mouth and then take her to the bathroom door where she would wait until the teacher had time to implement the overcorrection procedure. By being taken to the same place every time, she would begin to associate it with the aversive consequence. Eventually that place itself will begin to acquire punishing properties.

A fourth component of programming for maintenance is fading or gradually removing the behavioral consequences applied contingently to the desired response. (Fading also refers to gradually removing S^Ds such as physical prompts when shaping a behavior.) When fading, we substitute naturally occurring reinforcers for the artificial or programmed reinforcers that were used in the intervention (Foxx, 1982b). Since we initially paired intrusive reinforcement (e.g., edibles) with socials, the socials are likely to become more powerful reinforcers, and therefore, are more likely to maintain the behavior after the edibles have been faded. Eventually, this programmed praise and attention can be gradually faded until a natural reinforcer such as drinking some juice maintains the student's getting a glass, removing the container from the refrigerator, and pouring her own juice.

Once the student has overlearned the behavior and we have thinned the reinforcement schedule, delayed presenting reinforcement, and faded any artificial consequences, we can stop taking data every day.

However, we must not stop taking data altogether. Instead we take follow-up data or maintenance probes to make sure the target behavior still satisfies our criterion. Depending on the situation and on the strength of the response in the student's repertoire, we may want to drop back to taking data every other day or possibly once a week. If the probes indicate that the student's performance remains at an acceptable level, we could further reduce our probes to once every 2 weeks or even once a month. If ever a probe indicates that the student's performance does not meet criterion, immediately (e.g., in another session the same day or the next day) take another probe. If again the performance is inadequate, reinstitute treatment beginning with the least intrusive procedure in the intervention. Once acceptable responses are noted again, thin, fade, and continue to take follow-up data. For behaviors that the student does not perform often but yet are important, continue to take maintenance probes to ensure that the behavior has survived the passage of time.

Generalization

Right at the beginning when we are planning our intervention, we need to plan for generalization. Training for generalization can be implemented either during treatment or after the criterion in the behavioral objective has been achieved. Stokes and Baer (1977) discuss a number of techniques designed to facilitate generalization. Several of these are presented as follows along with examples that relate to intervention with SPH students.

Use Sequential Modification

This technique involves training the behavior under a variety of stimulus conditions. Here we implement the intervention everywhere

that we want generalization to occur, i.e., across responses, students, settings, or change agents.[16] If we want Gary to demonstrate appropriate toileting behaviors at home and at school, then we carry out the intervention at home as well as at school. Home treatment could be conducted simultaneously or after school treatment was found to be successful. The advantage to the latter approach is that we first can make sure that we have an intervention that is effective in modifying Gary's inadequate toileting skills before training the parents in how to implement treatment procedures. Before implementing the intervention in another setting, take probes of the student's behavior in that setting. If the student did generalize from the first training condition, then sequential modification may not be necessary. When you do carry out treatment procedures in another setting (i.e., in a different location or with a different person), remember to take maintenance probes under the first condition to make sure that the student still exhibits the desired level of the behavior there.

Introduce to Natural Maintaining Contingencies

This technique involves transfering behavioral control from the change agent to natural contingencies that operate in the environment the student is in or to which he will return. As previously discussed, fading artificial behavioral consequences facilitates maintenance as well. To ensure that the natural environment is reinforcing, we may need to prime others to praise Gary for appropriate toileting behaviors. For example, tell the aides who supervise Gary at lunchtime

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[16]Technically, sequential modification is not an example of programming for generalization because what initially was a pontreatment setting becomes a treatment setting when the intervention is implemented there.

and after school hours that Gary has recently learned how to toilet himself and that they should praise him when he does. (Sometimes, in addition to or even in lieu of taking data on the student's self-initiations and accidents, I have the staff take data on their own behavior, e.g., how often they reinforce the student's appropriate behavior.) If a student's behavior is to be maintained in a nontreatment setting, there may be times when we need to modify that setting. For example, if our intervention focused on making Leonie more independent in dressing herself, we probably would need to rearrange the natural environment by getting caretakers to refrain from helping her get dressed. This point is extremely important. For busy aides, teachers, or parents, it is much easier and faster to help Leonie get dressed rather than to have more of their time taken up by standing back and letting Leonie do it herself. Therefore, they are likely to continue to dress her themselves unless you explain the necessity of their not providing any prompts.

If your treatment procedures have been effective in modifying the student's behaviors in one controlled setting, be sure to examine the extent to which there are competing contingencies in the setting to which you want the behavioral gain to generalize. For example, you may find that Conrad wiped off all the tables after lunch within 5 minutes during training sessions conducted in a simulated lunchroom. However, when he was required to wipe off the tables in the real lunchroom, our data indicated that it took him over 30 minutes to do the same number of tables. One likely reason for this increase was that there was a powerful competing contingency, namely, a TV set that was on during the entire clean-up period. An obvious solution, then, is to turn off the

TV while he is cleaning up.

Train Sufficient Exemplars

Programming generalization to untrained stimulus conditions and to untrained responses can be done by training a sufficient number of exemplars (rather than all) of these stimulus conditions or responses. Exemplars can be divided into at least three categories: trainers, settings, and response classes. If only one person serves as the change agent, a student's behavior is unlikely to generalize to situations in which other change agents are involved. However, high levels of generalization to many different staff is much more likely to occur if a second trainer also implements the treatment procedures. Frequently, a sufficient number of exemplars to promote generalization is a small number, often no more than two. Therefore, it is best to use at least two trainers rather than one when implementing an intervention. For example, you could have both the teacher and aide, both parents, or a parent and one of the student's older siblings teach the student the same responses.

A second category of exemplars is setting. To enhance generalization, we should train the student in a number of settings. Sometimes we become so pleased with ourselves for improving a student's behavior in one setting that we forget to check to make sure that we can demonstrate it in other settings. We may toilet train Gary all right but unfortunately, there is only one bathroom, namely, the one in which training took place in the entire school or at home that he will use.

A third category of exemplar is response class. It refers to a group of responses that are organized together because operations

applied to a subset of responses in the class affect the other responses in the same way. For example, if we target a student to imitate touching a toy and picking up a glass and then probed her to see if she imitated other unreinforced behaviors, we probably would find that she imitated similar small-motor responses in the same class, but not dissimilar behaviors in a different response class such as vocal imitations. Although generalization may occur across behaviors within well-defined response classes, it may not occur to behaviors in other response classes unless generalization programming occurs within that class as well. We want generalization to occur so that we do not have to intervene on every behavior. To facilitate generalization, then, we need to provide special training for several behaviors in different response classes. For example, if we are trying to increase a student's compliance, we need to provide training for "do" (e.g., pick up your fork) and for "don't" requests (e.g., don't throw your fork on the floor) since these two are separate response classes (see Neef, Shafer, Egel, Cataldo, & Parrish, 1983). Although a student may become more compliant when we target "do" requests, improved compliance to "don't" requests is not likely to occur automatically; we must also target "don't" requests.

There is some question about how quickly to introduce diversity in stimulus exemplars, at the onset of training or gradually. Many researchers (e.g., Skinner, 1968) have suggested that stimulus conditions should not be varied until the student has performed the desired behavior in the presence of a single set of stimuli. Following this reasoning, treatment procedures should be implemented in one setting, with one teacher, and with one set of materials until the

student has met the criterion. However, others (e.g., Brown, Branston, Hamre-Nietupski, Pumpian, Certo, & Gruenewald, 1979) have suggested that the teaching of multiple exemplars is best done concurrently. Adopting this approach, we would train a student in more than one setting, across one or more response classes, using one or more trainers. Note that these two strategies are not necessarily mutually exclusive. The following is an example of training sufficient exemplars that combines the two and that also includes sequential modification. Dana is a 3-year-old severely retarded girl who is noncompliant. Treatment begins in individual sessions with one therapist who reinforces her compliance to different response classes ("do" and "don't" requests). A second therapist is introduced gradually and conducts some of the treatment sessions. Finally, when compliance has increased to an acceptable level during individual sessions, we implement the treatment procedures in a group setting in which there are a number of different change agents.

Program Common Stimuli

Ensure that there are stimulus components common to both the training and generalization settings. There are a number of S^Ds that can be included in both settings. One type is the student's peers. Provide the opportunity for peers who were present in the training setting also to be present in the generalization setting. If we teach Conrad how to wipe off tables in a simulated lunchroom with only four other students present, we can have these students present in the real school lunchroom as well. (In general, it would be better to do the training in the real lunchroom to begin with.) A second type of S^D that we could incorporate into both the training and generalization

settings is functional training stimuli. Various aspects of the training procedures (e.g., the positioning of the therapist or a verbal prompt such as "do this") or physical training environment (e.g., the same kinds of towels or tables and chairs) can be used to program for generalization. You also can use some of the same instructional materials in both settings. To facilitate generalization of Dana's improved compliance, we include some of the very same requests in the group setting as were in the individual treatment setting.

Summary

To prepare SPH students to function as independently as possible, we want them to learn to perform functional behaviors in a variety of settings. To ensure that a student's newly acquired skill or recently decreased level of behavior persists over time (maintenance) and transfers to a variety of nontreatment settings (generalization), we must program for their occurrence. Generalization training can be done either during or after the intervention. To facilitate maintenance, we need to give the student ample opportunity to perform the behavior once it has reached criterion and to reinforce it on a CRF schedule to strengthen it (overlearning). Then we can proceed to thin the reinforcement schedule and to delay reinforcement progressively until it approximates what is found in the natural environment. We also need to fade artificial behavioral consequences as much as we can, although some students will continue to need them. To facilitate generalization, we can introduce the student to natural maintaining contingencies which means that we may need to prime people to reinforce the appropriate behavior or to refrain from prompting him if independence is the goal. We also may need to alter more powerful

competing contingencies. A number of different exemplars (e.g., trainers, settings, and response classes), should be included. At the very least, have two trainers implement the treatment procedures in two settings for any intervention. It is also advisable to include stimulus components such as peers, aspects of the treatment procedures, and parts of the physical training environment that are common to both the training and generalization settings. If these techniques are not sufficient to promote generalization, use sequential modification being careful to ensure that the change agents in the additional settings implement the treatment procedures correctly.

Chapter 6

ADAPTIVE EQUIPMENT AND ELECTRONIC TECHNOLOGY

Adaptations for the Physically Handicapped

Some SPH students have varying degrees of physical handicap that necessitate adaptations in their programming. For example, adaptations of utensils can be made to help these students grasp them, thereby allowing them to develop competence in self-feeding. To make a utensil easier to control, add bulk to the handle by inserting it into a large spool, foam or rubber ball, or plastic or rubber tubing. You can also enlarge the handle width by wrapping it with tape or rubber strips. For those students who demonstrate no functional grasping skills, you can use Velcro bands around the student's open palm and attach the utensil to the band located on the underside of her palm. An excellent reference for adapted eating utensils is Verhaaren and Connor (1981). They also provide many examples of other types of adaptations for students with physical impairments.

Microswitches

A recent development in programming for SPH students involves the use of microswitches which increase the student's ability to interact with her environment. For example, instead of listening to the radio only when a care provider turns it on, the student can press a switch that allows her to turn on the radio when she wants to. Microswitches have been used to increase a number of appropriate behaviors such as holding up the head rather than letting it droop over. This type of behavioral intervention, thus, can help to counteract muscular atrophy. As the muscle tone increases, she becomes increasingly able to hold up her head.

There are three components of microswitches (M. Palmer, personal communication, August 24, 1983). First is a switch that the student activates herself by applying pressure. Second is an active stimulation programmer or control unit. It records the number of responses and the number of reinforcements delivered. It includes a timer to produce an interval of sensory reinforcers such as music or the movement of battery operated toys. These reinforcing events comprise the third component. Some switches allow the student to select from two reinforcers.

Microswitches can be extremely useful in interventions for SPH and physically impaired students. They offer a severely handicapped person the opportunity to have some control over her environment rather than being completely passive as other people decide what and when activities will occur. If you are interested in receiving technical assistance in implementing microswitch programs, you can contact either of the following people:

Jack Cavanagh (515) 280-6408
Darl Vander Linden (515) 282-0499
P. O. Box 1863
Des Moines, Iowa 50306

Additional information and equipment may be obtained from:

Handicapped Childrens Technological Services[17]
RFD 2, Box 60-B
Foster, Rhode Island 02825
(401) 397-7666

Adaptive Aids
State of Arizona
DDD/Adult Services
P. O. Box 13178
Tucson, AZ 85732

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[17]A videotape training package is also available for rental or purchase.

Chapter 7

GUIDELINES FOR IMPLEMENTING PROGRAMS

Designing and implementing interventions with severely and profoundly handicapped individuals is a complex process that involves many crucial components. You need to know what behaviors are appropriate to change, how to measure and to record them, how to apply behavioral principles, and how to involve school personnel in the intervention since they are the primary persons to carry out educational program. Foxx (1982a, 1982b) outlines several suggestions for providing effective programs for SPH students.

1. As a psychologist, you may work in several different settings and probably will function more as a consultant than as an individual behavior therapist who serves as the primary change agent for a student. To make sure that your treatment recommendations are appropriate, it is important that you know the student. It is strongly advised that you observe the student directly by conducting narrative recordings and systematic observations. Moreover, you should spend some time interacting directly with the student. Similarly, it is important to become thoroughly familiar with administrative and staff structures. Therefore, you should spend time with administrators, medical personnel, and school personnel (Grabowski & Thompson, 1977). Find out what they do (be interested), let them know what you do, and seek their input right from the beginning.

2. Provide a program that will help the student function in the least restrictive environment. We need to ensure that our goals are functional and not designed just to keep the student occupied or for

our own convenience.

3. Examine the reinforcers and any negative consequences to make sure they are having an effect. Do not change a program until you have thoroughly analyzed what the problem is. At the same time, avoid rigidity. If a particular intervention is still not effective after a fine-tuned analysis and the appropriate modifications, change it (Grabowski & Thompson, 1977).

4. Before a program is implemented, it is essential that all persons who carry out the treatment procedures are well trained beforehand. If a program is to have any chance of success, contingencies must be administered proficiently and systematically. To train staff, you can apply the same behavioral principles that you use with students (Kazdin, 1975). For example, school personnel will need reinforcement for implementing a program. Although a review of techniques for training change agents is beyond the scope of this manual (see Kazdin, 1975, and Whitman, Sciback, & Reid, 1983, for more detail), you should be aware that the process consists of at least two components: (a) training behavior modifiers in new procedures and (b) managing their performance in the actual environment where they interact with the student. In the initial staff training, we want to target general principles (e.g., reinforcement and extinction) as well as specific procedures for a given case. Since skills the staff acquired during training sessions do not necessarily generalize to the on-the-job environment, we must follow-up on how interventions are being implemented (Whitman et al., 1983).

5. Involve people who interact with the student in the early design of the program and keep them informed about what you do. When

using level 2 and level 3 reductive procedures, be sure to obtain prior written permission.

6. Develop a value system that respects the dignity of the student. The following are several points to keep in mind: (a) try not to let personal bias enter in, such as refusing to use edible or sensory reinforcers because you think the student should be able to respond to socials alone; (b) be systematic in your application of treatment procedures and take data to evaluate them (be sure to give change agents summarized feedback on the data they have recorded to encourage them to continue collecting it, Grabowski & Thompson, 1977); and (c) always attempt to use the least restrictive reductive procedure before implementing more intrusive ones.

As you are very well aware, assessing and providing interventions for severely and profoundly handicapped students is complicated, and traditional approaches are inadequate. No one person knows everything there is to know about the SPH population. Do seek out professional assistance from other psychologists, teachers, or consultants when you want a second opinion on your treatment design or when you are not sure where to start. As when we are learning any new skill, we are likely to feel uncomfortable at first. But with some experience and continued dialogue with other professionals who work with SPH students, you will become more and more proficient. Assessing and providing treatment for SPH students is indeed a challenge, and there is little doubt that you will encounter your fair share of frustrations. However, it is an exciting area and one filled with rewards when you see time and time again that your interventions did make a difference.

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APPENDICES

Appendix A

Interview Format

Persons present at evaluation: _____

Current Strengths: _____

BEHAVIOR PROBLEM CHECKLIST:

___ Noncompliant
___ Tantrums
___ Aggressive
___ Verbally Abusive
___ Pica
___ Self-injurious behav.
___ Inapprop. sexual behav.
___ Self-stimulation
___ Destructive
___ Disruptive
___ Bedtime problems
___ Dressing problems
___ Feeding problems
___ Vomiting/ruminating
___ Steals
___ Runs away
___ Toileting problems
___ Enuresis
___ Encopresis
___ Smears feces
___ Inapprop. play
___ Activity: Hi__ Lo__
___ Language problems

Other problems: _____

Potential reinforcers: _____

_____

_____

Problem 1: _____ Description: _____

_____

Frequency: _____ Duration: _____

Intensity: _____ Latency: _____

Onset: _____ Trend: _____

Setting: _____

Current Antecedents: _____

Current Consequences: _____

Additional Information: _____

Treatment Goals: _____

Direct Observation: _____

_____

Suggested Measurement System: _____

Suggested Treatment: _____

Appendix A (continued)

Problem 2: _____ Description: _____

_____

Frequency: _____ Duration: _____

Intensity: _____ Latency: _____

Onset: _____ Trend: _____

Setting: _____

Current Antecedents: _____

Current Consequences: _____

Additional Information: _____

Treatment Goals: _____

Direct Observation: _____

_____

Suggested Measurement System: _____

Suggested Treatment: _____

Problem 3: _____ Description: _____

_____

Frequency: _____ Duration: _____

Intensity: _____ Latency: _____

Onset: _____ Trend: _____

Setting: _____

Current Antecedents: _____

Current Consequences: _____

Additional Information: _____

Treatment Goals: _____

Direct Observation: _____

_____

Suggested Measurement System: _____

Suggested Treatment: _____

Appendix B

Example Interview

Persons present at evaluation: *Mother, Paul, Susan Epps*

Current Strengths: *walks & runs well; is strong*

BEHAVIOR PROBLEM CHECKLIST:

- x Noncompliant
- x Tantrums
- x Aggressive
- ___ Verbally Abusive
- x Pica
- x Self-injurious behav.
- ___ Inapprop. sexual behav.
- x Self-stimulation
- x Destructive
- x Disruptive
- x Bedtime problems
- x Dressing problems
- x Feeding problems
- ___ Vomiting/ruminating
- ___ Steals
- ___ Runs away
- x Toileting problems
- ___ Enuresis
- ___ Encopresis
- ___ Smears feces
- ___ Inapprop. play
- x Activity: Hi x Lo ___
- x Language problems *(nonverbal; "squeals" a lot)*

Other problems: _____

Potential reinforcers: *running; TV, talking books, balls; Cream of Wheat, cookies, macaroni & cheese, mashed potatoes, chicken, soda, juice; hugs (but not for too long or too tight), being kissed or tickled.*

Problem 1: *not doing what asked to do* Description: *Mother is not sure if he is non-compliant due to his being stubborn or not understanding. When given request, he laughs or acts as if mother did not say anything.*

Frequency: *does not comply w/23 out of 25 requests/day* Duration: *NA*

Intensity: *NA* Latency: *NA*

Onset: *he has always been this way* Trend: *worsening*

Setting: *everywhere*

Current Antecedents: _____

Current Consequences: *repeats requests; manual guidance*

Additional Information: *Minds sometimes when mother says, "Come here" in certain tone or when she asks him to put food back in refrigerator*

Treatment Goals: *for Paul "to respond more"*

Direct Observation: *Mother presented 5 requests from 2-9 times each. She attempted to use manual guidance, but Paul was 100% noncompliant and tried to lie on floor.*

Suggested Measurement System: *Compliance with 5 requests per day*

Suggested Treatment: *Reinforcement for compliance and manual guidance*

Appendix B (continued)

Problem 2: *High activity level* Description: *in motion almost constantly*

very active throughout day
Frequency: *especially in the morning (8-12) & in evening after 5:00* Duration: *NA*

Intensity: *NA* Latency: *NA*

Onset: *Age 2 years* Trend: *Worsening*

Setting: *everywhere*

Current Antecedents:

Current Consequences: *sometimes mother spanks him; he will then slow down for about 10'*

Additional Information: *See p. 3*

Treatment Goals: *for Paul to slow down, not to run around so much*

Direct Observation: *Paul was moving throughout most of the eval. He walked around the room, got up and down off the sofa, rocked chair back and forth w/his hands, & slapped his hands on the window.*

Suggested Measurement System: *frequency of activity switches, time sampling*

Suggested Treatment: *reinforcement of progressively longer periods of time engaged in activity*

Problem 3: *self-injurious behavior (sib)* Description: *bangs head against wall, people, steel bed; slaps hand, arm, or head; no striking objects against self*

Frequency: *4-5 times/day* Duration: *several seconds*

Intensity: *mild to moderate* Latency: *NA*

Onset: *about 3 months ago* Trend: *worsening*

Setting: *everywhere*

Current Antecedents: *when he is especially active*

Mother uses combination of things which she reports helps somewhat: says "don't do that," holds his head, spanks hands, tries to divert his attention & get him interested in something else.
Current Consequences:

Additional Information:

Treatment Goals: *Eliminate sib; find out why he engages in sib*

Direct Observation: *during eval: 5 head bangs against mother, 4 head bangs against sofa, and 4 slaps on his arm*

Suggested Measurement System: *frequency*

Suggested Treatment: *Extinction, DRO*

Appendix B (continued)

Other Information:

Paul's mother expressed her concern that he might be mentally retarded. She reports that Paul's father views him as normal. She provided specific information about his behavior & has a number of very appropriate parenting skills such as using manual guidance when he does not follow through with a request. Any attempts at training her in the use of other behavior management skills would probably be successful. The mother reported that Paul's babysitter would be very willing to come in for training as well.

Additional observations were made during the evaluation. These are grouped into five categories & are described below.

Self-stimulation - rocked 30 times

Aggression - pulled mother's hair & therapist's hair, bit mother's finger

Pica - sucked on mother's earring which had to be removed from his mouth

Destructiveness - tore pages in book, tore ear off stuffed animal

Disruptiveness - Paul's high activity level was disruptive. In addition, several times he pushed & pinched the faces of both the mother & the therapist & pulled at the mother's earrings.

The mother is very concerned about Paul's high activity level. She is concerned about his safety & reported that if you let his hand go, he will run out into the street. He also climbs up on things & jumps down. He recently had stitches when he fell while running around. She is also concerned about bedtime problems. She reported that she puts Paul to bed at 9:30, but that he does not usually fall asleep until 11:00. Then he frequently wakes up at 2:00 & may stay awake several hours before falling back asleep.

Although Paul is usually very active, mother reported that he sometimes does nothing or plays with a tiny piece of paper for about 5 minutes. This behavior occurs about 3 times a day.

Appendix C

Responses to Practice Exercise 1: Goals and Objectives

Goal 1: Since Marty is severely handicapped, this goal is probably not very functional since being able to differentiate shapes has little if any relation to daily-existence skills. Moreover, achieving the goal is not likely to help prepare Marty to function in the community. We would be better off dropping this goal and starting with more functional goals.

Goal 2: Since dressing oneself is a daily-existence activity, we would consider this goal to be functional. It is a broad goal that could be broken down into a number of behavioral objectives. For the sake of brevity, let us consider objectives just for putting on a T-shirt.

Objective 1: (acquisition stage)

Behavioral dimensions:

Topography: pulling shirt over head, putting each arm through appropriate arm holes, pulling bottom of shirt down to waist

Frequency: once a day for five consecutive days

Duration: within 15 minutes

Accuracy: putting shirt on correctly (i.e., not backwards or inside out)

Situation: Joseph's room, chest of drawers with clothes to choose from.

Criterion level: at least one shirt put on completely

Behavioral Objective: When in his room with clothes to choose

Appendix C (Continued)

from, Joseph, within 15 minutes, will pull his shirt over his head, put each arm through the appropriate arm holes, and pull the bottom of his T-shirt down to his waist so that it is neither backwards nor inside out at least once a day for five consecutive days.

Objective 2: (fluency-building stage)

Same as above except:

Duration: within 10 minutes.

Objective 3:

Duration: within 7 minutes

Objective 4:

Duration: within 3 minutes.

Goal 3: For the same reasons as those given for goal 1, this goal probably does not warrant a very high priority unless Rachel is in a setting in which a certain color symbolizes something important (e.g., red stands for "danger" and "do not touch").

Appendix D

Whole- and Partial-Interval Recording

A 5-minute videotape is made of Paul as he makes up his bed. An observer views the tape the first time and uses whole-interval recording. The second time she views it, she uses partial-interval recording. An "X" indicates the occurrence of Paul's making up his bed for either the entire 10-second interval or for any part of the interval.

	Whole Interval	Partial Interval
1'-1		X
2	X	X
3	X	X
4		
5		
6	X	X
2'-1	X	X
2		X
3		X
4		
5		
6		
3'-1		X
2		
3		
4		X
5		X
6		
4'-1		
2		X
3		
4		
5		
6		X
5'-1		X
2	X	X
3		
4		
5		X
6		

Interpretation:

1. Whole: Paul worked at making up his bed in 17% (5/30) of the intervals observed. This measure underestimates his behavior, but we do know that he spent at least 50 seconds out of the 5 minutes actually making up his bed.

2. Partial: Paul worked at making up his bed in 50% (15/30) of the intervals observed. This measure overestimates his behavior. It does not indicate that he spent 50% of the 5 minutes (2-1/2 minutes) making up his bed.

It is evident that we get very different estimates of Paul's behavior depending upon which measurement system we use. When reporting results, we need to be sure to clarify what the data actually do and do not mean.

Appendix E

Responses to Practice Exercise 2: Measuring Behaviors

Measurement System	Dependent variable
1. event recording	frequency of food stealing (or number of occurrences of food stealing)
2. whole- or partial-interval recording; momentary time sampling	percent interval self-stimulation; percent observations of self-stimulation
3. measures of permanent product	number of clothes folded
4. duration recording; event recording	total time dressing; number of items put on
5. event recording; latency recording	percent compliance; time before beginning request

Appendix F

Calculating Coefficients of Agreement for Measures of Permanent Product and Interval Recording

Example 1: Two observers take data while Frank sets the table and independently score whether he completes five subtasks correctly.

Subtask	Primary Observer		Reliability Observer
1	+	(A)	+
2	0	(D)	+
3	+	(A)	+
4	+	(A)	+
5	+	(A)	+

$$\text{reliability} = \frac{A}{A + D} = \frac{4}{4 + 1} = 80\%$$

Example 2: Two observers use partial-interval recording to take data on Charlotte's mouthing behavior (i.e., pica).

10-second Interval	Primary Observer	Overall Reliability	Reliability Observer	Occurrence Reliability
1'-1	X	(D)		(D)
2		(D)	X	(D)
3		(A)		-
4		(A)		-
5	X	(A)	X	(A)
6		(A)		-
2'-1	X	(A)	X	(A)
2		(A)		-
3		(A)		-
4		(A)		-
5	X	(D)		(D)
6		(A)		-

Appendix F (continued)

$$\text{Overall reliability} = \frac{A}{A + D} = \frac{9}{9 + 3} = 75\%$$

$$\text{Occurrence reliability} = \frac{A_{oc}}{A_{oc} + D_{oc}} = \frac{2}{2 + 3} = 40\%$$

In this example, we reach different conclusions about how reliable our measurement system is depending upon whether we consider overall or occurrence reliability. Overall is spuriously inflated. We, therefore, should examine occurrence reliability. Because it is so low (40%), we need to go back and refine our definition of pica and/or retrain our observers.

Appendix G

Calculating Coefficients of Agreement for Event, Duration, and Latency Recording

Example 1: Two observers take frequency data on Gene's object throwing in a 15-minute period.

	Primary Observer	Reliability Observer	Total Reliability
10:00-10:05	1111	~~1111~~	4/5 = 80%
10:05-10:10	1	1	1/1 = 100%
10:10-10:15	~~1111~~ 1	~~1111~~	5/6 = 83%

Example 2: Two observers take data on how long it takes Anthony to dress himself in the morning.

Primary Observer: 9'38" Reliability Observer: 9'47"

For duration recording, we usually round to the nearest minute, half minute, quarter minute, or whatever, depending upon how precise you want your measurement to be. If we round the above duration measures to the nearest half minute, total reliability would be calculated as follows:

$$\frac{9.5}{10.0} = 95\%$$

Example 3: Two observers take data on how long it takes Edwin to respond to the teacher's gestural prompt for him to wash his hands.

Primary Observer: 6" Reliability Observer: 8"

If we leave our measures as they are, total reliability is calculated as follows:

$$\frac{6}{8} = 75\%$$

Appendix H

Summary Raw Data Sheet (First Condition Only)

Condition	Primary Observer		Reliability Observer				
Session/Date (15 min.)	% Interval #	%	% Interval #	%	Reliability overall	occur.	nonoc.
Baseline							
1 (10-3-81)	72/90	80	70/90	78	86/90 = 96	65/75 = 87	21/22 = 95
2	85/	94	86/	96	80/ = 89	47/50 = 94	33/45 = 73
3	67/	74					
4	70/	78					
5	68/	76	65/	72	85/ = 94	62/68 = 91	23/70 = 33
Summary of phase:	Range: 74-94						
	Mean: 362/450 = 80				251/270 = 93	174/193 = 90	77/137 = 56
	Median: 70/90 = 78						

Appendix I

Answers to Practice Exercise 3: Determining Record Floors and Ceilings

1. Record Floor: Minimum response of one out of five times is 20%.

   Record Ceiling: Maximum possible value is 100%, an obvious ceiling so do not need to indicate on graph.

2. Record Floor: Each minute is divided into six intervals for a total of 90 (15 x 6) intervals in the entire observation session. A minimum of 1 response out of 90 is about 1%. Because this response floor is so low, you probably do not really need to indicate it on the graph.

   Record Ceiling: Maximum possible value is 100% (no need to indicate on graph).

3. Record Floor: An observation every 15 minutes for 1 hour yields 4 observations. A minimum of 1 response out of 4 is 25%.

   Record Ceiling: Maximum possible value is 100% (no need to indicate on graph).

4. Record Floor: Whenever we take frequency data, our record floor is simply 1. Because it is obvious, we probably do not need to show it on the graph.

   Record Ceiling: Cannot be determined since there are an unlimited number of opportunities for Julianne to verbalize spontaneously.

5. Record Floor: The minimum response of one in five minutes is .2/minute.

   Record Ceiling: Since there are only 20 settings, the ceiling is 20 if we use frequency data. In this example, however, we are using a rate measure. Since Jason might finish before the five minutes are up (e.g, 20/4 min or 20/2 min), we cannot determine a record ceiling.

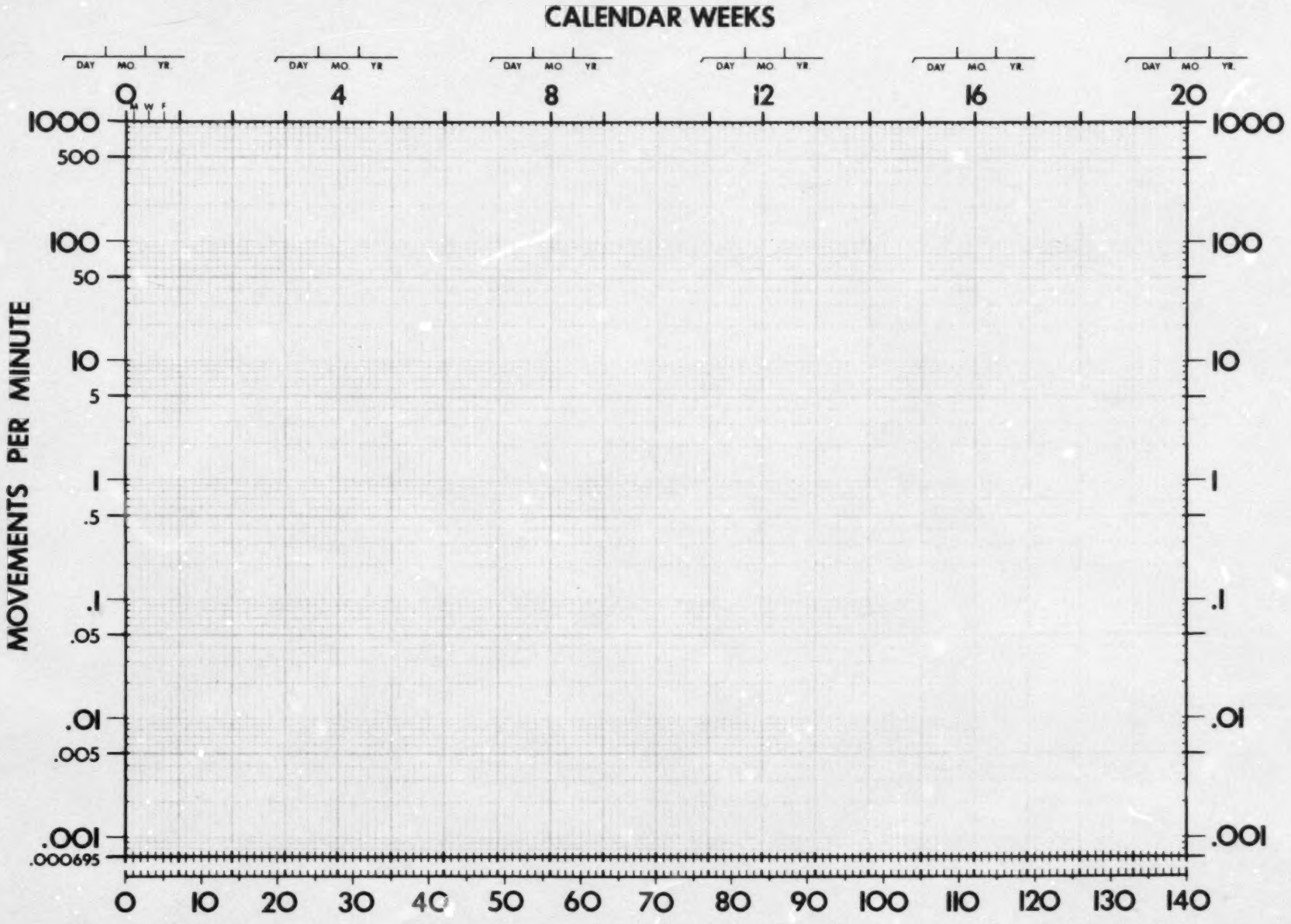
Appendix I (continued)

6. Record Floor: As in example 4, with frequency data the record floor is 1.

   Record Ceiling: Her room plus eight other rooms yields a ceiling of 9. (Note: The ceiling may vary somewhat if someone is away from the setting for at least a day.)

Appendix J

Standard Behavior Chart



PROJECT TEAM

BEHAVER _____ AGE ___ LABEL _____

SUPERVISOR _____ ADVISOR _____ MANAGER _____

COUNTER _____ CHARTER _____ NOTES _____

MOVEMENT CYCLE

NAME IT _____

COUNT WHEN _____

_____ OCCURS

Appendix K

Practice Exercise 4: Application of a Shaping Procedure

1. Target behavior

Behavioral dimensions. Topography: both hands on handle with right hand about 6 inches above the left; use of short sweeps; sweeps material on floor to center of room. Intensity: sweeping done forcefully enough to remove items from the floor. Duration: continuous sweeping, with pauses of no greater than 5 seconds, for 3 to 5 minutes. Criterion level. When the entire room has been done and everything on the floor has been swept to the middle of the room. (Note: In this example, use of a dust pan will be taught later.)

2. Initial behavior

After lunch on three days, the teacher's aide gave Ross a broom and instructed him to sweep the floor. On the first day, Ross held the broom with one hand and stood there. On the second and third days, he held the broom handle with both hands (right hand about 6 inches above left) and made three short sweeps. However, the broom barely touched the ground and he did not move from one position. The initial behavior is holding the broom handle with both hands and very lightly completing three sweeps from one position.

3. Reinforcers

Ross spends much of his time painting during leisure time; painting (a high-probability behavior) is an activity reinforcer. He is also especially fond of fresh fruit which is an edible reinforcer. To ensure that we have a variety of reinforcers, activity pictures of painting and several different pieces of

Appendix K (continued)

fruit (orange, banana, and apple slices all divided into small pieces) will be used. To maximize their potency, Ross is only permitted to paint if he has earned activity pictures from the sweeping session. Similarly, he can receive the fruit only during the session. Social reinforcement in the form of labeled praise will be paired with the activity and edible reinforcers.

4. Reinforcing initial behavior

One reinforcer paired with socials will be randomly selected and presented contingent on each occurrence of Ross' holding the broom handle with both hands and very lightly sweeping the floor three times from one position.

5. Reinforcing successive approximations (only the first two approximations are discussed)

The first approximation to the target behavior is identical to the initial behavior except that the appropriate intensity for sweeping is required. One reinforcer is presented contingent on the occurrence of three behaviors at this level of performance. The second approximation adds taking one step and making three more sweeps. This second step proved to be too large because Ross did not perform it correctly after five prompts from the aide. A smaller step, therefore, was considered. It included the first step plus taking one step to move to another position (making three more sweeps was deleted). This second approximation was adequate, and Ross was reinforced for each of five correct performances.

Appendix K (continued)

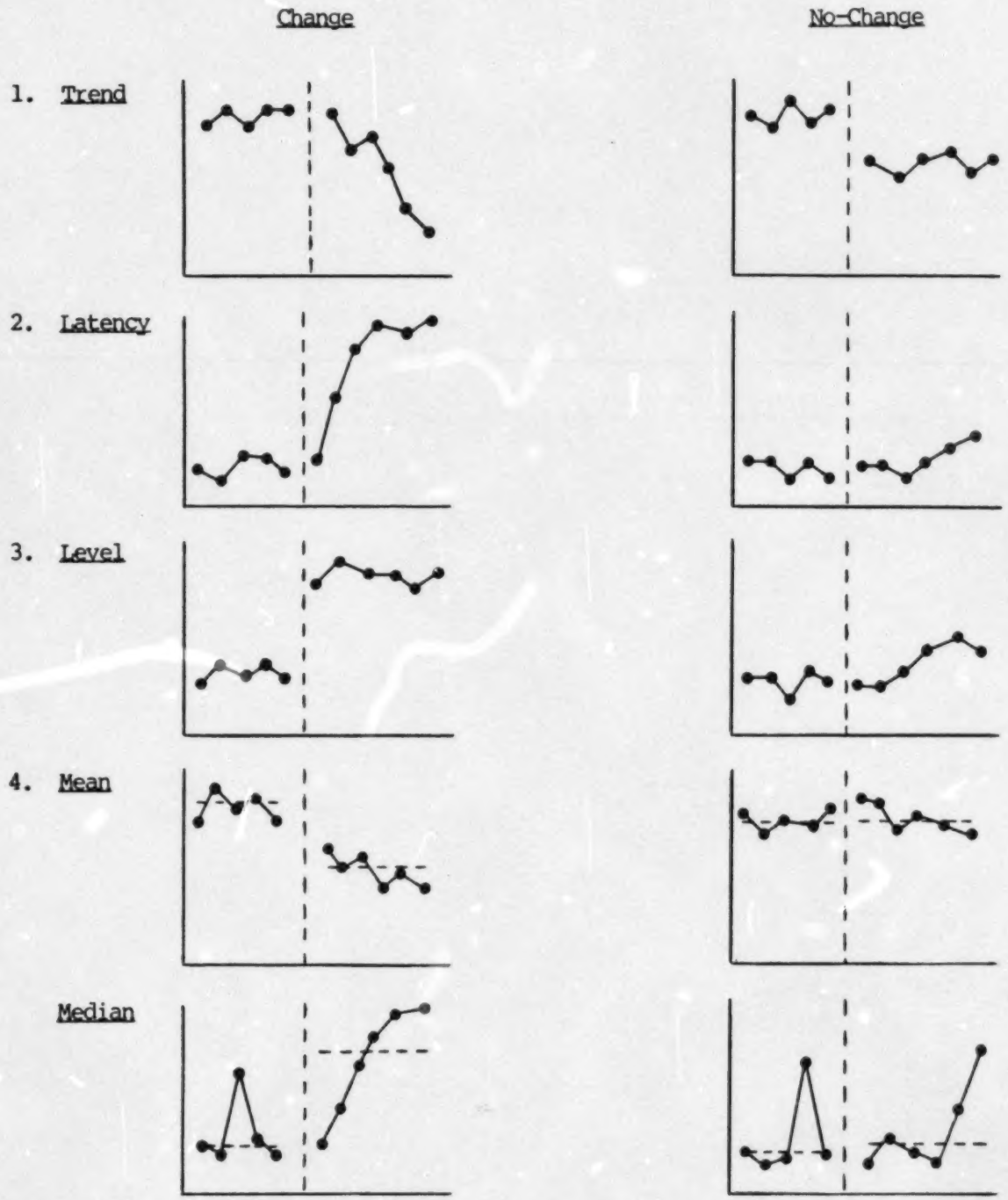
6. Reinforcing target behavior on continuous schedule

One reinforcer paired with socials is presented when the entire room has been done and all material on the floor has been swept to the middle of the room.

7. Reinforce target behavior on intermittent schedule

Thin CRF schedule gradually (e.g., VR2, VR3, VR5). Eventually we hope to fade out all reinforcers except for socials which can remain on a variable schedule.

Our next steps in training Ross in functional sweeping skills would be to target additional behaviors (e.g., getting the broom from the closet and using the dust pan) and to plan for generalization.

Appendix L

Examples of Change and No-Change Situations When Considering Trend, Latency, Level, and Mean or Median